DuraLAN™ Fast Ethernet NICs with Duralink64™ Software ANA™-62000 / 64000 Family

User's Guide

adaptec®

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This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy, and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. However, if this equipment does cause interference to radio or television equipment reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

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- Increase the separation between equipment and receiver.
- Connect the equipment to an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/television technician for help.
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Adaptec, Inc.
ANA-62044
ANA-62022
ANA-62011/TX
ANA-64044
ANA-62011LV
ANA-64022LV
ANA-64044LV

Tested to Comply
with FCC Standards

FOR HOME OR OFFICE USE

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- EN55022 (1998) Emissions
- EN55024 (1998) Immunity:
  - EN61000-4-2 (1998) Electrostatic discharge: ±4 kV contact, ±8 kV air
  - EN61000-4-3 (1998) Radiated immunity
  - EN61000-4-4 (1995) Electrical fast transients/burst: ±1 kV AC, ±0.5 kV I/O
  - EN61000-4-5 (1995) Surges ±1 kV differential mode, ±2 kV common mode
  - EN61000-4-6 (1996) Conducted immunity: 3 V
  - EN61000-4-11 (1994) Supply dips and variation: 30% and 100%

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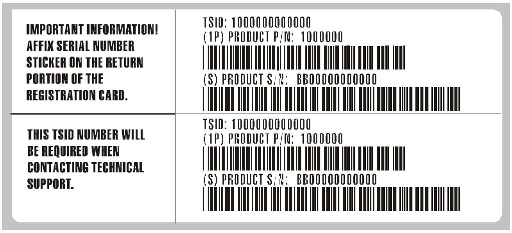

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TSID: 1000000000000
(1P) PRODUCT P/N: 1000000
(S) PRODUCT S/N: BB00000000000

THIS TSID NUMBER WILL BE REQUIRED WHEN CONTACTING TECHNICAL SUPPORT.

TSID: 1000000000000
(1P) PRODUCT P/N: 1000000
(S) PRODUCT S/N: BB00000000000

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Product Overview

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General Information

This user's guide describes how to install your Adaptec® DuraLAN™ Fast Ethernet Network Interface Cards (NICs) as well as how to configure the Adaptec Duralink64™ drivers to accommodate specific features available on various Operating Systems (OSs). Please review the system requirements outlined in this chapter (see *System Requirements* on page 1-3) before you begin.

OSs supported by Adaptec Duralink64 drivers described in this document include all current OSs for Microsoft Windows, Novell, and Unix's UnixWare 7.0.

Fast Ethernet

Fast Ethernet is a networking standard defined by the Institute of Electrical and Electronic Engineers (IEEE) in IEEE Specification 802.3u. Fast Ethernet runs at 100 Megabits/sec, or at 200 Megabits/sec in Full Duplex Mode.

Fast Ethernet uses the same Carrier Sense Multiple Access with Collision Detection (CSMA/CD) architecture used on 10BaseT and 10Base2—10 Megabits/sec network specifications, which allows for easy integration with existing networks.

Reference Sources

- To use Duralink64 drivers with the Linux OS, or to download Linux drivers, refer to Adaptec's web site at:

  http://www.adaptec.com
- For information about NetWare, visit Novell's Web site at:

  http://www.novell.com

Advisory

To avoid injury to people or damage to equipment and data, be sure to follow the cautions and warnings in this document. Adaptec does not claim to have included in this document every condition or situation that might require a caution or warning notice. Be sure to consult the documentation for your computer and any connected equipment when you are installing the equipment or changing its configuration.

Warning: *Always* use caution when handling electrical equipment.

System Requirements

These sections describe the minimum requirements to configure your new Adaptec DuraLAN NIC.

Hardware Requirements

The minimum hardware requirements for using the Adaptec DuraLAN NIC are as follows:

System Component	Requirements
All NICs (single, two, and four ports) require:	■ Available bus-mastering PCI slot ■ Most recent PCI system BIOS is recommended ■ Intel x86 platform with single- or multiprocessor (Pentium Pro or above is recommended when running under Windows 2000) ■ 16-MB RAM (64-MB RAM required when running under Windows 2000)
Additionally, two- and four-port NICs require:	■ System BIOS supporting PCI-to-PCI bridge chip ■ Multiport NICs require PCI 2.1-compliant bus

Note: Each port on an Adaptec DuraLAN NIC needs an IRQ (Interrupt Request) number/line. The system BIOS allocates the IRQs to the various ports. Adaptec NICs support IRQ sharing and can share interrupts with other PCI devices that are PCI 2.1 compliant.

Software Requirements

The minimum software system requirements are as follows:

- **Windows**®—Windows NT 4.0 Workstation or Server, Windows 98 and Windows 98 SE, Windows 2000 (includes Windows 2000 Professional, Server, Advanced Server, and Data Center), Windows Me (Millennium Edition), or Windows XP (Experienced Professional), Home Edition and Professional

- **NetWare**—NetWare 4.2, 5.*x*, or 6.0, or Novell Client32
- **UnixWare**—UnixWare 7.*x*
- **Linux**—Linux Kernel 2.4 and later have third-party drivers embedded that support these NICs (If you have an earlier version of the kernel, links to drivers are available on the Adaptec Web site.)

Note: Although Duralink64 drivers support older versions of Windows and NetWare, Adaptec does not support any OS that is no longer supported by its developer.

Hardware Overview

Adaptec provides the following PCI 10/100 DuraLAN Fast Ethernet NIC models:

64-Bit 33 MHz PCI	64-Bit 66 MHz PCI	64-Bit 33/66 MHz PCI
ANA-62044	ANA-64044	ANA-64044LV
ANA-62022		ANA-64022LV
ANA-62011/TX		ANA-62011LV

Note: All NICs are 64 bits. All NICs support 3.3V and 5V.

Adaptec DuraLAN 64-bit NICs can also be used in a 32-bit PCI slot provided the NIC fits in the slot. If the DuraLAN NIC does not fit the slot, return it to your place of purchase for a replacement.

Performance

The more peripherals and NICs in your system, the more loaded it becomes. At this point, a 64-bit PCI is a significant benefit that provides the following:

- Allows devices to get on and off the PCI bus faster
- Doubles the capacity of the PCI bus—twice as much data transferred at once (or the same amount transfers twice as fast)

- Increases system bandwidth and efficiency, increasing overall system performance
- Works in both 32-bit or 64-bit PCI 2.1-compliant slots

Increased Throughput

This data illustrates the increase in throughput when using a 64-bit PCI NIC. The throughput shown does not account for PCI-bus overhead.

MHz	64-Bit PCI
33	266 MB/sec
66	532 MB/sec

Increased Efficiency

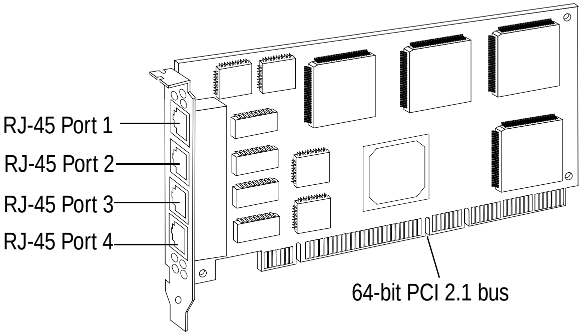
Data moves at more efficient rates with the DuraLAN 64-bit NICs: 128 bytes are transferred in 16-PCI cycles.

Physical Views

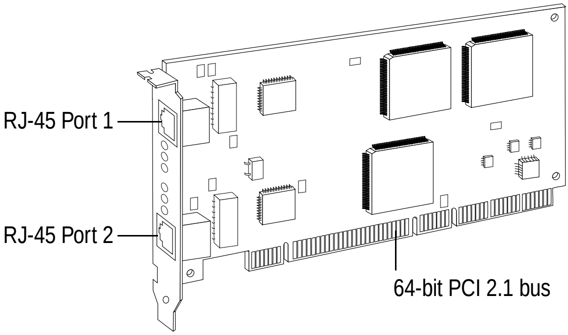
Following are illustrations and brief descriptions of features available for each of the NICs in this document. Depending on the NIC model, the following features are available:

- Selection of single-, two-, and four-port NICs
- Autosensing
- Full Duplex Mode support
- Ports can run at independent speeds for maximum flexibility
- PCI compliance
- Mirrored Server Link (MSL)
- Fault tolerance
- Server clustering

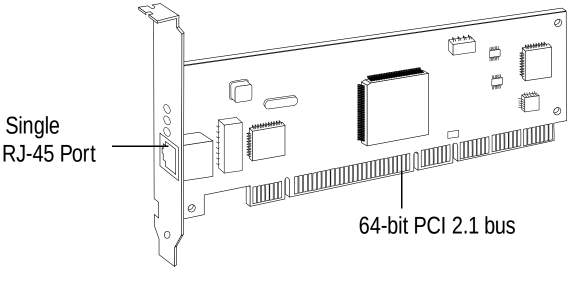
ANA-64044LV, ANA-64044, and 62044



ANA-64022LV and ANA-62022



ANA-62011LV and ANA-62011/TX Single64™



Link Configurations

Adaptec DuraLAN NICs provide a standard (standalone) port configuration on all supported OSs (see *Software Requirements* on page 1-3). In a Standalone configuration, each port is independent with its own address. It typically connects to a physically separate network. In addition to the Standalone configuration, the Duralink64 software suite supports link configurations that minimize downtime and optimize throughput. Available link configurations vary depending on your OS. The following table lists each type. All configurations are described in this chapter.

Driver Type	Supporting OS
DuraLAN Standalone Driver	Windows 98 Windows Me Windows NT 4.0[1] Windows 2000 Windows XP NetWare 4.2, 5.*x*, 6.0 and Novell Client32 UnixWare 7.*x* Linux Kernel 2.4[2]
Duralink64 Failover	Windows NT 4.0 Windows 2000 Windows XP NetWare 4.2, 5.*x*, 6.0
Duralink64 Port Aggregation	Windows NT 4.0 Windows 2000 Windows XP NetWare 4.2, 5.*x*, 6.0 and Novell Client32
Fast EtherChannel (FEC)	Windows NT 4.0 Windows 2000 Windows XP NetWare 4.2, 5.*x*, 6.0 and Novell Client32

[1] When installing the Duralink64 driver on Windows NT, you need to specify the features you want to include.

[2] In Linux Kernel 2.4 and later, third-party drivers are embedded. These drivers are not supported by Adaptec. If you have an older version of the kernel, links to these drivers are available at Adaptec's Web site.

Driver Configurations for Adaptec DuraLAN NICs

A number of driver configurations are available for the Adaptec DuraLAN NICs. With the Standalone driver configuration, each port acts like a separate NIC and has its own protocol level address. In this driver configuration, each port or NIC would normally connect to a physically separate network. Be sure to observe correct subnetting when configuring your protocol while using the Standalone driver configuration. Consult your operating system documentation for details.

The following driver types are outlined in the sections that follow:

- DuraLAN Standalone driver

  The Standalone driver uses each DuraLAN port independently. You will find references to *standard* and *standalone*. These terms are used somewhat interchangeably. The software GUI, including online menus, tables, and text use *Standalone* and *Standard*. In most cases, the meaning is the same.

  Note: The Windows 98, Windows Me, UnixWare, and Linux drivers support the Standalone port configuration *only.*

- Duralink64 Failover driver

  The Duralink64 Failover driver groups two ports in a Failover combination, one as the primary port and the other as the backup port. The ports may be connected to a hub or switch.

  Note: Novell Client32 *does not* support Duralink64 Failover. Install the DuraLAN Standalone driver for these OSs.

- Duralink64 Port Aggregation or FEC drivers

  The Duralink64 Port Aggregation driver groups up to twelve ports together and must be used with a switch. FEC can be grouped in groups of two or four. This grouping requires a switch that supports FEC.

Always use the latest software version available for your DuraLAN NIC. Drivers are updated regularly on Adaptec's Web sites, thereby providing enhanced performance and new features.

Duralink64 Failover

Duralink64 Failover software provides protection from network-link failures on Fast Ethernet servers running mission-critical applications. During a port failure, Duralink64 Failover keeps the connection to the server live by moving all traffic on the affected segment to a backup port. When a failure is detected on the primary port, that port is disabled and the backup port takes over to continue data transmission, keeping the connection running without interruption.

Duralink64 Failover is often used in a troubled environment to provide failover capabilities when any of the following conditions exist:

- An Ethernet link loss
- A watchdog timer expires
- An abnormal hardware interrupt occurs
- Abnormal send/receive counters, such as too many collisions or errors occur on the segment

Failover ports can be connected to a hub or switch.

Duralink64 Failover supports NICs with servers running under Windows NT 4.0, Windows 2000, Windows XP, and Novell NetWare 4.2, 5.*x*, and 6.0.

Duralink64 Port Aggregation

The Duralink64 Port Aggregation configuration allows you to create a virtual port by grouping up to twelve ports together. Throughput is distributed over the grouped ports. This grouping distributes the network load by sharing the resources of all ports in a group. In the Port Aggregation group, one port becomes the "primary" port and its address is given to the protocol. The primary port sends and receives data while it's backup sends data only. However, the backup port takes over, sending and receiving data, when the primary port fails. Thus, the group behaves as a single interface, allowing the software to manage the combined resources of the group efficiently. In the event of a port failure, the remaining ports carry the load and keep the network running and uninterrupted.

Note: Although a switch is required for Port Aggregation, the switch itself does not require any special trunking capability.

FEC (Fast EtherChannel)

FEC is a technology developed by Cisco Systems based on standard Fast Ethernet and used in parallel to provide the additional bandwidth network backbones require today. FEC combines two or four Fast Ethernet links to a single logical connection capable of carrying 800 Megabits/sec of aggregate full-duplex throughput. In addition to scalable bandwidth, the technology also provides fault tolerance and resiliency, protecting the network from outages due to failed links.

FEC allows grouping of DuraLAN ports or NICs allowing full utilization of available bandwidth (up to 800 Megabits/sec). Up to four single-port NICs, two 2-port NICs, or one 4-port NIC can be grouped. This technology also provides load balancing and management of each link by distributing traffic across multiple links in the channel. In addition, FEC technology provides redundancy in the event of link failure.

Duralink64 software and all of Adaptec DuraLAN NICs support FEC technology, allowing redundancy and high-speed aggregation between switches supporting FEC and servers configured with Adaptec's FEC driver option.

FEC is available on select Cisco Catalyst switches and Cisco routers.

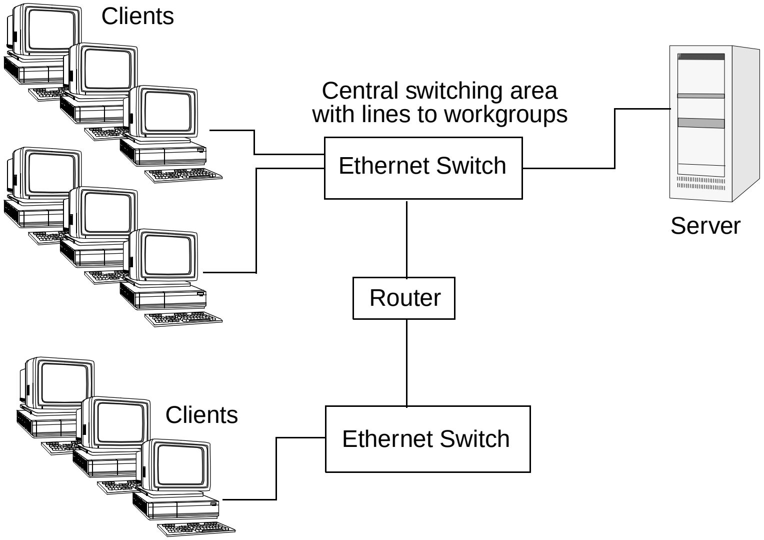
For additional information on Cisco's FEC technology, visit the Cisco Systems Web site at http://www.cisco.com.

Network Configuration Examples

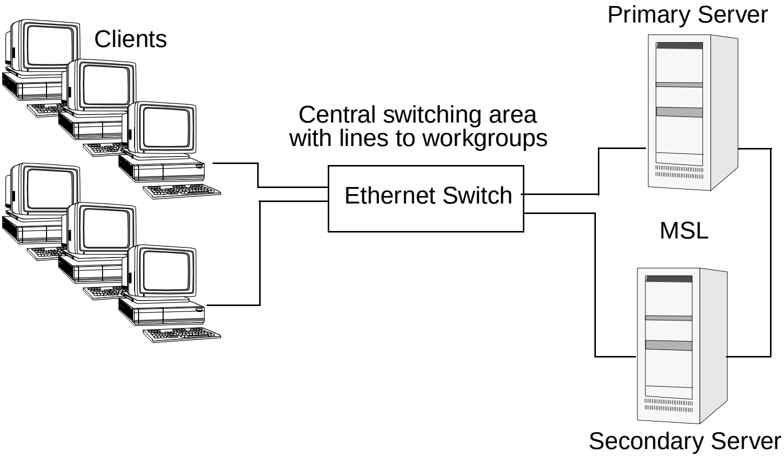
This section provides examples of typical network configurations, and compares them to configurations using Duralink64 Port Aggregation and Duralink64 Failover. It also shows the benefits of using Duralink64 Failover.

Traditional Network Configurations

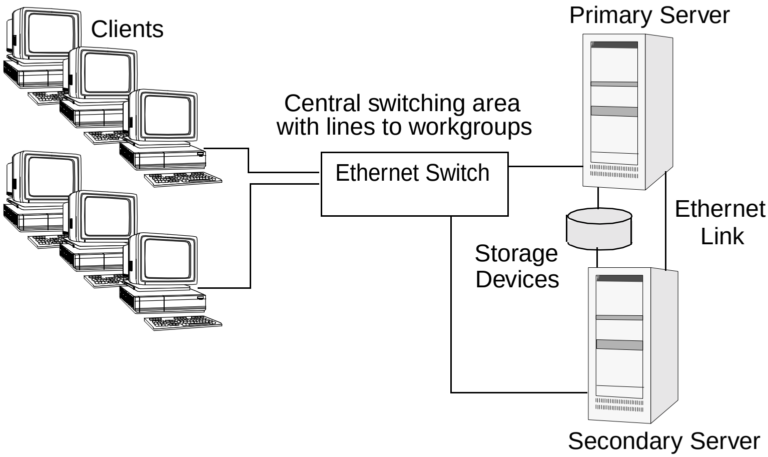
The following figure shows a single-segment server initialized at 100 Megabits / sec with Full Duplex Ethernet (FDE). The segmented server in this example is limited to 200 Megabits / sec. If the connection to the server fails, clients can still communicate with one another via the Ethernet switch; but server accessibility will, of course, be impossible without the link.



The next figure shows how *fault tolerance* is achieved by doubling the hardware and adding a special version of NetWare (SFT3). One server is active while the other is ready to take over if the active server fails. Data is kept current between servers via an MSL.



The figure below illustrates a configuration with Windows NT server clustering (Microsoft's *Wolfpack*).

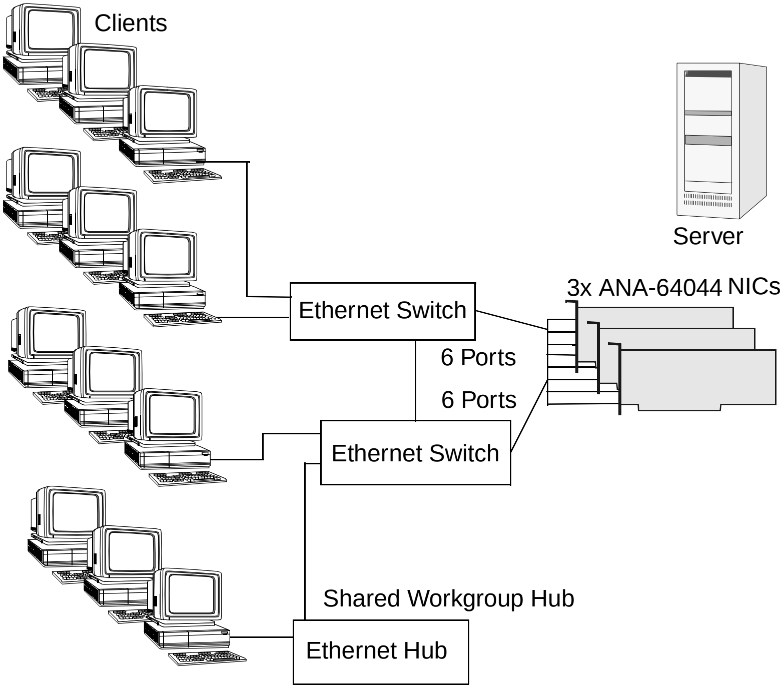


Servers with Duralink64 Port Aggregation

A server with Duralink64 Port Aggregation can use up to 12 Adaptec PCI Fast Ethernet ports in one aggregated group (at 1.2 Gigabits / sec per group).

If a contributing member of an aggregated group fails, that member is excluded from the group. The remaining ports distribute the existing load.

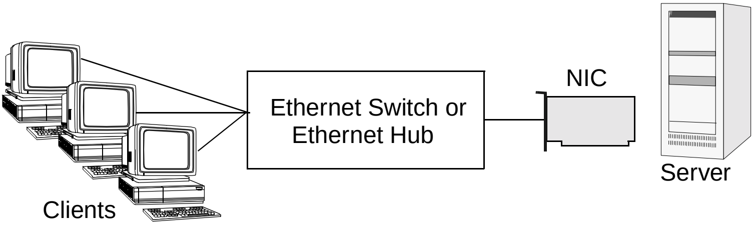
The following figure shows a 12-port server using three Adaptec DuraLAN 4-port NICs. In this configuration, the server has a cumulative bandwidth of 1.2 Gigabits / sec on a single virtual segment. Further, the network is fault tolerant; data transmission is uninterrupted if any port fails.



Network without Duralink64 Failover Protection

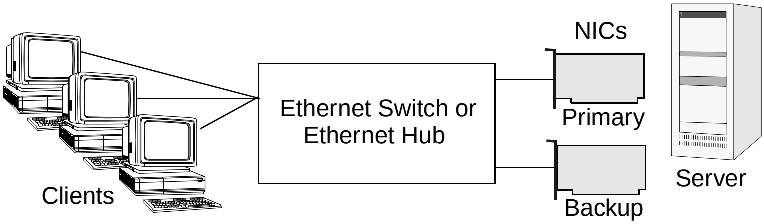
The primary and backup Adaptec DuraLAN Fast Ethernet NICs or ports reside in the server. Duralink64 Failover operates on these NICs to provide redundancy on the server. The backup port does not operate until the primary port fails.

The following figure shows one NIC connected to a hub or switch on an Ethernet segment. If the NIC fails, all network traffic is stopped.



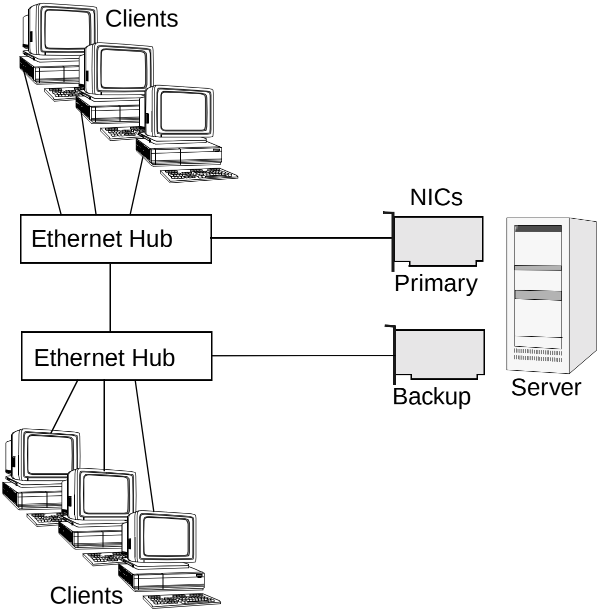
Single Hub or Switch on an Ethernet Segment with Failover

This figure shows two Adaptec DuraLAN NICs connected to a hub or switch on an Ethernet segment. Duralink64 Failover provides failover capability if one NIC fails.



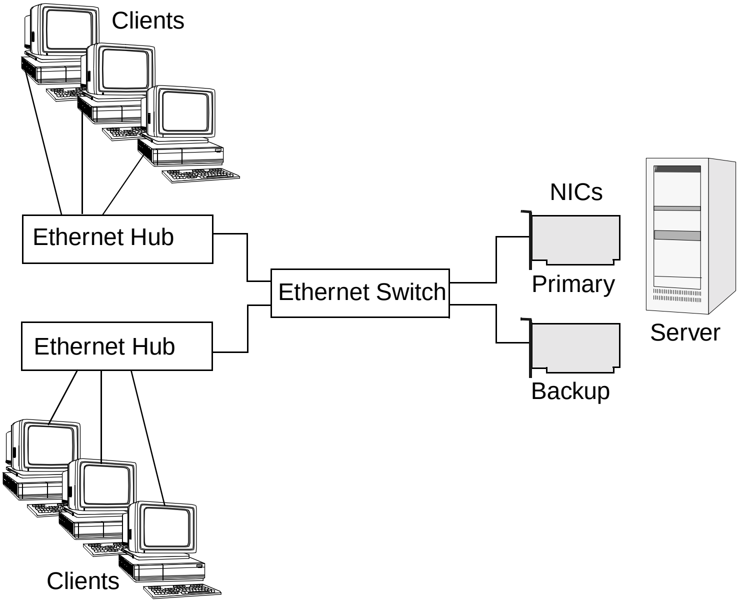
Dual Hubs

The following figure shows each Adaptec DuraLAN NIC connected to a separate hub to provide redundancy. If the hub port being used by the primary NIC fails, the backup NIC becomes active, and all network traffic is immediately directed through it.



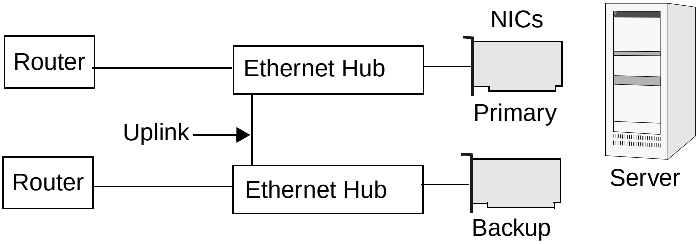
Failover Protection with Dual Hubs and Ethernet Switch

The following figure shows how Duralink64 Failover, with two failover groups, provides network redundancy to a switched network. Ethernet switches provide network traffic segmentation.



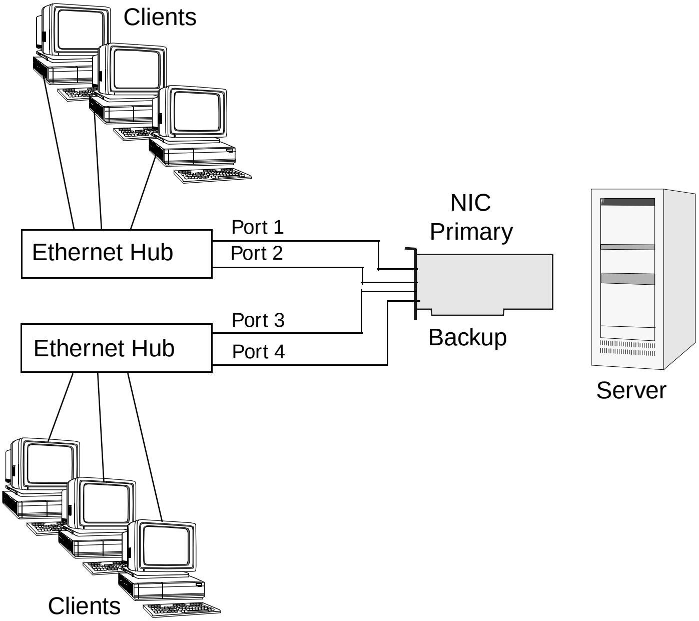
Dual Hubs with Routers

The following figure shows how to set up Duralink64 Failover in a network configuration using routers. Routers provide WAN and LAN connectivity and allow physical network protocol redundancy.



Dual Hubs with a 4-Port NIC

The following figure shows failover protection using an Adaptec DuraLAN 4-port NIC. Ports 1 and 3 are used as the primary ports to each Ethernet hub. Ports 2 and 4 are backup ports connected to each hub.



2

DuraLAN NIC Installation

In This Chapter

Installing the DuraLAN NIC 2-2
Connecting the Network Cable 2-4

Installing the DuraLAN NIC

Before you begin, be sure you are installing the appropriate NIC for your particular OS(s). See *System Requirements* on page 1-3 for both hardware and software requirements.

Warning: Before you start to install the Adaptec DuraLAN NIC, turn off power to the PC, and disconnect the power cord.

To install the DuraLAN NIC, follow these steps:

1. Ground yourself by touching an unpainted surface of the PC case.
2. Remove the cover from your computer. Refer to the manufacturer's documentation for help.
3. Locate an unused PCI expansion slot. For best performance, install the 64-bit DuraLAN NIC in a 64-bit PCI expansion slot (32-bit PCI expansion slots may also be used).

   Some noncompliant 32-bit PCI expansion slots *do not* support 64-bit NICs. This is because the slot's outside notch is not deep enough to allow the bus contacts to fit around the slot. If the 64-bit DuraLAN NIC does not fit in the slot, please return it to your place of purchase for a compatible board.
4. Unscrew the bracket screw and remove the expansion slot bracket cover.

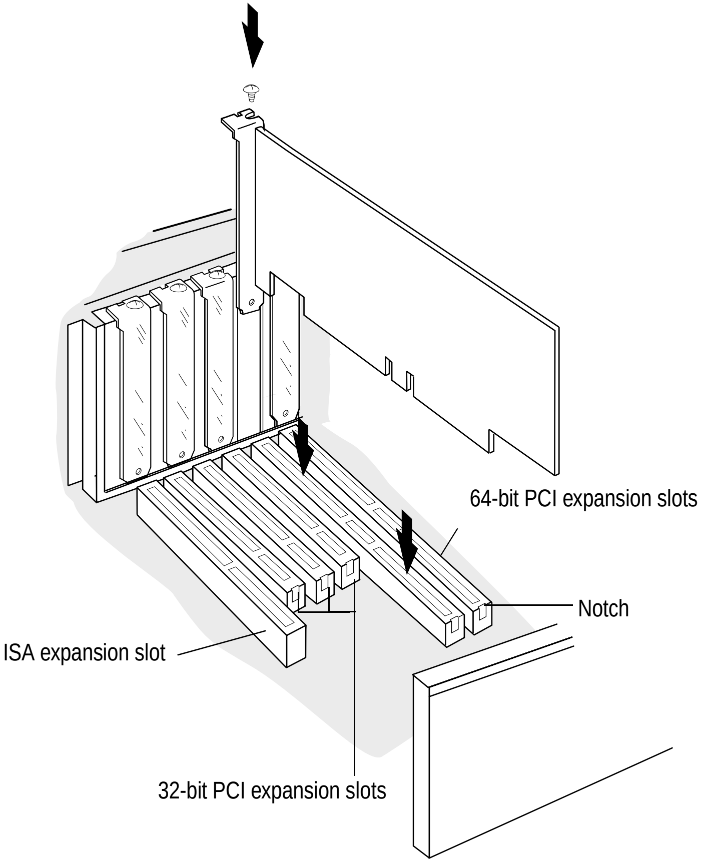
Note: PCI slots and NICs come in two varieties: 3.3-volt, and the more common 5-volt. All Adaptec PCI NICs support 5-volt and 3.3-volt slots.

---

5. Carefully remove the DuraLAN NIC from its antistatic container.
6. Verify the model name on the NIC.
7. Check the NIC for any visible signs of damage that may have occurred during shipment. If you find a problem, immediately notify your network supplier and the shipping service that delivered your NIC.

8 Insert the NIC into the expansion slot, pressing down firmly until the bus contacts are seated in place. The NIC should be level within the slot.

9 Replace the screw removed in Step 4, as shown in the figure below, securing the NIC in position.



10 Replace the computer cover.

Continue with *Connecting the Network Cable* on page 2-4.

Connecting the Network Cable

Cable requirements for Adaptec DuraLAN NICs vary according to network speed, cabling standard, and the connector used. See Appendix A, *Cables and LEDs* on page A-1 for detailed information on cabling.

To connect the network cable, follow these steps:

1. Determine the appropriate cabling for your network.
2. Connect the cable to the NIC connector. (For multiport NICs, connect a cable to each port.)
3. Connect the other end of the cable to your hub, switch, or client.
4. Install the desired NIC driver (compatible with your OS).

3

Duralink64 Driver Installation for Windows

In This Chapter

Before You Begin *3-1*
Installing the Duralink64 Driver *3-2*
Installation Tips *3-10*
Removing Previously Installed Drivers *3-10*

Before You Begin

Before you begin, be sure the following hardware/functions are ready:

- Verify that all system, memory, and NIC requirements are met. (See *System Requirements* on page 1-3.)
- Verify that the new Adaptec DuraLAN NIC is installed properly in the server. (See Chapter 2, *DuraLAN NIC Installation* on page 2-1.)
- Check your system for installed DuraLAN NIC drivers.

Note: For Windows NT 4.0, only one driver type may be configured at any one time. You may install one of three drivers: the DuraLAN Standalone driver, Duralink64 Failover, or Duralink64 Port Aggregation. See *Removing Previously Installed Drivers* on page 3-10.

Graphical user interface (GUI) windows may vary slightly depending upon which OS version you are using. The general series of steps is generally the same.

Note on DuraLAN NIC Ports

When you are installing Adaptec DuraLAN NICs, it is a good idea to document where each port physically resides in the server, especially when two or more identical NICs exist. This is important because ports are identified by generic port names, such as Adptsf1, Adptsf2, Adptsf3, and so on.

Port names are assigned to ports in the order that the system scans these ports at boot time. Consequently, whenever you physically rearrange the network cards, the port names change as well.

Installing the Duralink64 Driver

In the following sections, aspects relating to driver installation are discussed.

Note: All NICs must be updated with the same version driver after installing an Adaptec Duralink64 5.2 driver. This process is not automatic for Windows NT 4.0.

HotPlug and Windows 2000/XP

Windows 2000 and Windows XP support HotPlug on server systems that have HotPlug-compatible hardware. HotPlug allows you to add or remove a NIC to your server system without turning off your computer. Refer to the system's user guide for more complete and specific details of how the system performs while the HotPlug slot is in service or when it is not being used.

Following is a description of successful Adaptec in-house procedures using IBM's Netfinity 7000 server to demonstrate how to properly remove or install the NIC.

To Remove the NIC:

1. Double-click the **Unplug** or **Eject Hardware** icon located at the bottom right corner of the desktop area. This brings up the Unplug or Eject Hardware window.
2. Select the ports that you want to remove, and click **STOP**.
3. Click on the port name to confirm selection, and click **OK**. The green LED on the top of the slot where the NIC is located will start to flash. This indicates that the NIC is no longer in service.
4. The NIC can now be unclipped and removed from its slot. The computer does not need to be turned off. The system will continue running and will reconfigure the remaining NICs.

To Install the NIC:

1. Insert the NIC into an empty slot.
2. Clip into place (different server brands have different clipping and locking systems). The computer will automatically sense the addition of the NIC and reconfigure itself to add the port(s) to the system.

Windows 2000 and Windows XP with GUI

Windows 2000 and Windows XP include a DuraLAN NIC driver embedded in the installation software. When you plug in a Plug and Play device, Windows 2000 and Windows XP install the necessary drivers, update the system, and allocate resources.

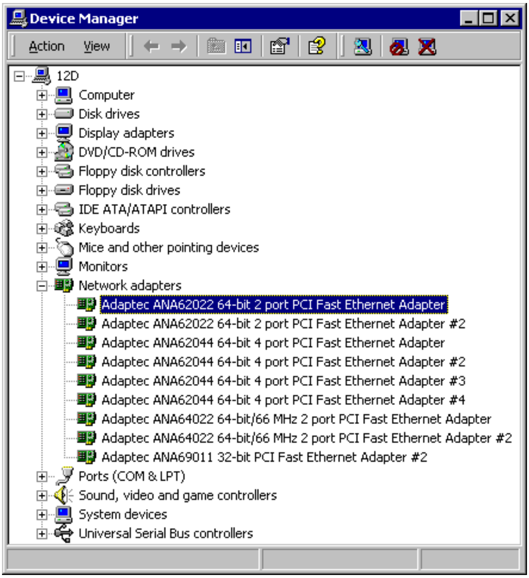
If you are installing Windows 2000 or Windows XP at this time, start with Step 11 when prompted for the DuraLAN NIC (the step is the same for either OS).

Following this installation process, and once you've canceled out of the Wizard, if you want to install other configurations, refer to Chapter 4, *Duralink64 Configurations for Windows* on page 4-1.

Installing Windows 2000

To install the DuraLAN driver on a Windows 2000 platform, follow these steps:

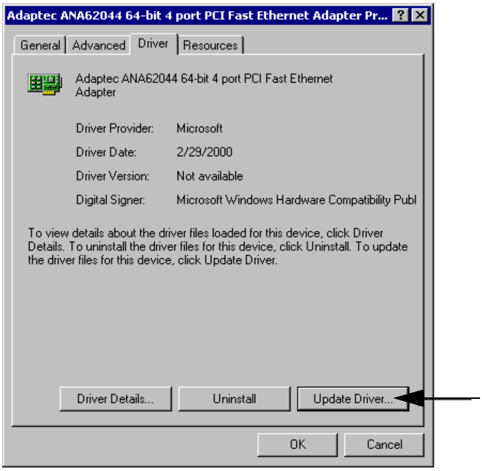
1. Start Windows 2000.
2. From the Start menu, point to **Settings**, and click **Control Panel**.
3. In the Control Panel, double-click the **System** icon .
4. In the System Properties window, select the **Hardware** tab, and click **Device Manager...** .
5. Double-click **Network adapters**.
6. Double-click the appropriate Adaptec DuraLAN NIC.



- 12D
  - Computer
  - Disk drives
  - Display adapters
  - DVD/CD-ROM drives
  - Floppy disk controllers
  - Floppy disk drives
  - IDE ATA/ATAPI controllers
  - Keyboards
  - Mice and other pointing devices
  - Monitors
  - Network adapters
    - Adaptec ANA62022 64-bit 2 port PCI Fast Ethernet Adapter
    - Adaptec ANA62022 64-bit 2 port PCI Fast Ethernet Adapter #2
    - Adaptec ANA62044 64-bit 4 port PCI Fast Ethernet Adapter
    - Adaptec ANA62044 64-bit 4 port PCI Fast Ethernet Adapter #2
    - Adaptec ANA62044 64-bit 4 port PCI Fast Ethernet Adapter #3
    - Adaptec ANA62044 64-bit 4 port PCI Fast Ethernet Adapter #4
    - Adaptec ANA64022 64-bit/66 MHz 2 port PCI Fast Ethernet Adapter
    - Adaptec ANA64022 64-bit/66 MHz 2 port PCI Fast Ethernet Adapter #2
    - Adaptec ANA69011 32-bit PCI Fast Ethernet Adapter #2
  - Ports (COM & LPT)
  - Sound, video and game controllers
  - System devices
  - Universal Serial Bus controllers

7. Click the **Driver** tab.

8 Click **Update Driver...** .



Adaptec ANA62044 64-bit 4 port PCI Fast Ethernet Adapter Pr...

Adaptec ANA62044 64-bit 4 port PCI Fast Ethernet Adapter

Driver Provider: Microsoft

Driver Date: 2/29/2000

Driver Version: Not available

Digital Signer: Microsoft Windows Hardware Compatibility Publ

To view details about the driver files loaded for this device, click Driver Details. To uninstall the driver files for this device, click Uninstall. To update the driver files for this device, click Update Driver.

9 Click **Next** to continue.

10 In the Install Hardware Device Drivers window, select **Search for a suitable driver for my device [recommended]**, and click **Next**.

11 Insert the compact disc (CD) containing the driver files into the CD-ROM drive.

12 In the Locate Driver Files window, select **CD-ROM drive**, and click **Next**.

13 In the Driver Files Search Results window, select **Install one of the other drivers**, and click **Next**.

14 In the Driver Files Found window, scroll to the driver list to the right to view the Location field, select the **netana.inf** file located on the CD, and click **Next**.

15 In the final Upgrade Device Driver window, click **Finish** to close the wizard.

16 In the Port Properties window, click **Close**.

17 Repeat Steps 6 through 16 for each Adaptec DuraLAN NIC port that is to be configured.

Note: If you are updating Adaptec drivers, make sure to upgrade all Adaptec-based network cards.

Installing Windows XP (Classic View)

Installing Windows XP in *classic view* is almost identical to the Windows 2000 procedure. Windows XP includes a DuraLAN NIC driver embedded in the installation software. When you plug in a Plug and Play device, Windows XP installs the necessary drivers, updates the system, and allocates resources.

If you have difficulty starting the installation process, refer to *Installation Tips* on page 3-10. To install the DuraLAN driver on a Windows XP platform, follow these steps:

1. Start Windows XP.
2. From the Start menu, click **Control Panel**.
3. In the Control Panel, click **Switch to Classic View**.
4. Double-click on **System**.
5. In the System Properties window, select the **Hardware** tab, and click **Device Manager...** .
6. Double-click **Network adapters**.
7. Double-click the appropriate Adaptec DuraLAN NIC.
8. Click the **Driver** tab.
9. Click **Update Driver...** .
10. The Hardware Update Wizard window appears. Select **Install from a list or specific location [Advanced]**, and click **Next**.
11. Click **Don't search. I will choose the driver to install.**, and click **Next**.
12. Click **Have Disk...** , and insert the CD containing the driver files into the CD-ROM drive.
13. Click **Browse**, and navigate to the Win2000 directory. Click **Open**.
14. You should see the netana.inf file. Click **Open** again.
15. Click **OK**.
16. Click **Next**.

Note: If a Digital Signature warning appears, click **Continue Anyway** to install.

17 Click **Finish**.

18 Repeat Steps 6 through 17 for each Adaptec DuraLAN NIC port that is to be configured.

Installing Windows NT 4.0

If you are installing Windows NT at this time, start with Step 6 when prompted for the DuraLAN NIC.

To install the DuraLAN driver on a Windows NT 4.0 platform follow these steps:

1. Start Windows NT.
2. From the Start menu, point to **Settings**, and click **Control Panel**.
3. In the Control Panel, double-click the **Network** icon.
4. In the Network window, click the **Adapters** tab.
5. In the Adapters tab, click **Add**.
6. In the Select Network Adapter window, click **Have CD**.
7. When the Insert CD window appears, insert the Duralink64 for Windows CD, and click **OK**.
8. In the Select OEM Option window, click the DuraLAN NIC model that is installed, and click **OK**.
9. In the Adaptec DuraLAN NIC Driver Installation window, select the driver, and click **OK.** For basic installations, select **Standard**.
10. If you want to install other configurations, refer to Chapter 4, *Duralink64 Configurations for Windows* on page 4-1.

Installing Windows 98

To install the DuraLAN driver on your Windows 98 platform, follow these steps:

1. Start Windows 98, wait for the Add New Hardware Wizard window to open, and click **Next**. (If the wizard does not open, refer to *Installation Tips* on page 3-10.)
2. Click **Specify the location of the driver (Advanced)**, and click **Next**.

3 In the new window, click **Search for the best driver for your device (Recommended)**.

4 Check **Removable Media (Floppy, CD-ROM ...)**, and **Specify a location**.

5 Also in the text box under Specify a location, enter the driver path—for example:

```
d:\
```

(The CD-ROM drive letter may vary.)

6 Insert the Duralink64 for Windows 98 CD, and click **Next**.

Note: If you do not insert the CD, the following message appears: Windows was unable to locate a driver for this device. If you do not want to install a driver now, click Next. To search again, click Back.

7 The system indicates that the driver file was found. Click **Next**. If prompted, insert the CD you used to install Windows 98, and click **Next**.

Note: You may receive the following Version Conflict message: A file being copied is older than the file currently on your computer. It is recommended that you keep your existing file. Do you want to keep the file?
Click **Yes**.

8 Click **Finish**, and remove the CD.

9 If the System Settings Change window appears, click **Yes** to restart the system.

Continue to Chapter 4, *Duralink64 Configurations for Windows* on page 4-1.

Installing Windows Me

For the initial installation of a DuraLAN driver on your Windows Me platform, follow these steps:

1. Start Windows Me, and wait for the Add New Hardware wizard to open. (If the wizard does not open, refer to *Installation Tips* on page 3-10.)
2. After the Add New Hardware wizard opens, Windows finds the new hardware PCI Ethernet Controller.
3. For first-time installation, when in this screen, click **Specify the location of the driver (Advanced)**, and click **Next**. (The next time you install a Duralink64 driver, you'll check the **Automatic search for the best driver (Recommended)** option (default), and click **Next**.)
4. Check **Removable Media (Floppy, CD-ROM ...)** and **Specify a location**. Also in the text box under Specify a location, enter the driver path—for example:

   ```
   d:\me
   ```

   (The CD-ROM drive letter may vary.)
5. Be sure the CD with the Duralink64 drivers is in the CD-ROM. The default automatically selected is for Removable Media (Floppy, CD-ROM...). Click **Browse**.
6. In the New Browse Folder, search for the correct directory. Select the directory where the driver for Windows Me resides, and click **OK**. (If you have more NICs to install, Windows Me will recognize it once the first NIC has been recognized and located.)
7. Back in the wizard, click **Next**.
8. In the new window, click **Next** again.
9. Then click **Finish**, and restart the system.
10. If you have more NICs to install, Windows Me will recognize them once the first NIC has been identified and located.

When finished, continue to Chapter 4, *Duralink64 Configurations for Windows* on page 4-1.

Installation Tips

This section provides tips to assist you in the DuraLAN driver installation.

Windows 2000/98/Me

How do I access Add New Hardware if it does not open?

1. From the **Start** menu, point to **Settings**, and click the **Control Panel**.
2. In the Control Panel, double-click **Add New Hardware**.

Windows XP

How do I access Add New Hardware if it does not open?

1. From the **Start** menu, and click the **Control Panel**.
2. Click the **Switch to Classic View** option.
3. In the Control Panel, double-click **Add New Hardware**.

Windows Clients Using Novell Client32

Connecting clients to the NetWare Duralink64 server requires an NDIS (Network Driver Interface Specification) driver. *Do not* use an ODI (Open Data-Link Interface) driver. See Chapter 6, *Installing Duralink64 Novell Client* on page 6-1.

Removing Previously Installed Drivers

This section provides instructions for removing the previously installed DuraLAN Standalone driver—a necessary step if you are installing the new Duralink64 driver included with your DuraLAN NIC.

Windows 2000/XP

To remove the previously installed Duralink64 driver from the Windows 2000 platform, follow these steps:

1. Right click **My Computer**, and click **Properties**.
2. Select the **Hardware** tab.
3. Click **Device Manager**.

4. Double-click **Network adapters**.
5. Select the Adaptec DuraLAN NIC that you wish to remove.
6. Right-click and select **Uninstall**.
7. Click **OK**; the driver will be uninstalled.

Windows NT 4.0

To remove the previously installed DuraLAN driver from a Windows NT 4.0 platform, follow these steps:

1. Double-click **My Computer**.
2. Double-click **Control Panel**.
3. Double-click **Network**.
4. In the Network window, click the **Adapters** tab.
5. In the Network Adapters list, click the Adaptec DuraLAN NIC you want to remove, and click **Remove**.
6. When asked if you wish to continue, click **Yes**.
7. Repeat Step 5 until all Adaptec DuraLAN drivers are removed.
8. When you are done, click **Close**.
9. Click **Close** to close the Network window.
10. Click **Yes** to restart your computer.

Note: When you restart Windows NT, a message may indicate that at least one service failed to start. This message will not appear after you add the new driver. Click **OK**.

Windows 98/Me

To remove the previously installed DuraLAN driver from the Windows 98/Me platform, follow these steps:

1. From the Start menu, point to **Settings**, and click **Control Panel**.
2. In the Control Panel, double-click **System**.

3. From the System Properties window, select the **Device Manager** tab, and double-click **Network adapters**.
4. Select the Adaptec DuraLAN NIC you want to remove, and click **Remove**.
5. Confirm the device removal by clicking **OK**.
6. Repeat Steps 4 and 5 for each existing DuraLAN NIC.
7. Restart the system.

4

Duralink64 Configurations for Windows

In This Chapter

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Note on DuraLAN NIC Ports

When you are installing Adaptec DuraLAN NICs, it is a good idea to document where each port physically resides in the server, especially when two or more identical NICs exist. This is important because ports are identified by generic port names.

Port names are assigned to ports in the order that the system scans these ports at boot time. Consequently, whenever you physically rearrange the network cards, the port names change as well.

Note: Windows 2000 currently does not support SNMP.

Configuring the Standalone Driver Ports

General Port Configuration in Windows OSs

Windows 2000, which includes a GUI, supports dynamic unload / reload of drivers. Driver updates no longer require a system reboot.

Windows XP makes use of the same GUI used for Windows 2000—with enhanceents included for Windows XP.

For each group of NICs, configure the property values (Connection Types, Transmit Checksum Offload, Receive Buffers, Receive Checksum Offload, and Scatter Gather) to be the same. For example, within a group, do not set up one NIC with the connection type as *Autodetect* and the other NIC's connection type as *100 Mbps*. If you make changes to a group, be sure that all NICs within the group have the same values.

Standalone, Failover, Port Aggregation, and FEC can be configured in mixed groups. For example, one NIC can be set up as Standalone, another group (two NICs) can be set up as Failover, and another group of NICs can be set up as Port Aggregation. A total number of 12 ports is supported for all configurations combined—with the exception of FEC, where a four-port maximum is allowed.

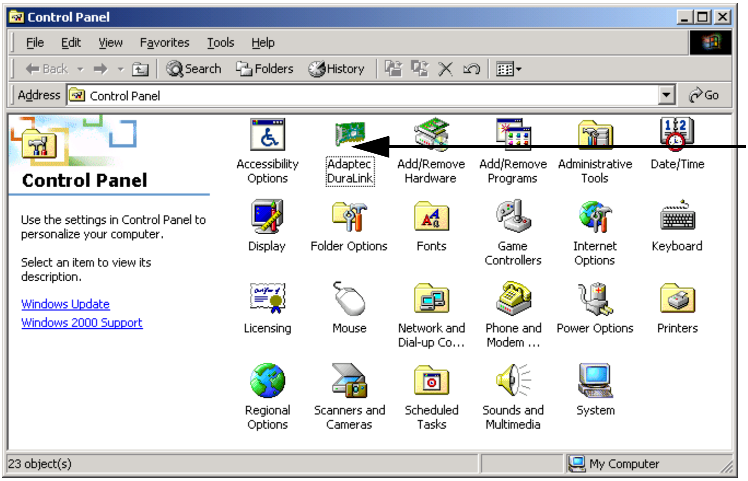
Note: Only two or four ports can be configured with Cisco's FEC.

Configuring Ports in Windows 2000 and Windows XP

To configure the Standalone driver ports in Windows 2000/XP and select the connection type for your Adaptec DuraLAN NIC, follow these steps:

1 Open the **Control Panel**.

2 In the Control Panel, double-click the **Adaptec Duralink** icon.

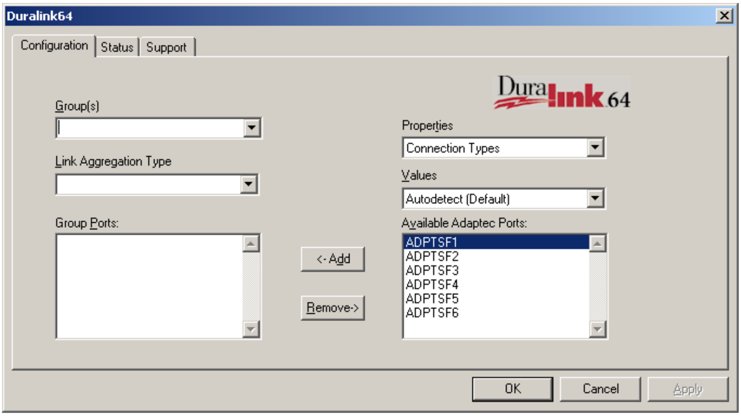


Use the settings in Control Panel to personalize your computer.

Select an item to view its description.

23 object(s)

3 In the Duralink64 window, select the **Configuration** tab, and select the port to be configured from the Available Adaptec Ports list.



Properties: Connection Types

Values: Autodetect (Default)

Available Adaptec Ports:

ADPTSF1
ADPTSF2
ADPTSF3
ADPTSF4
ADPTSF5
ADPTSF6

4 Select the speed for the connection. The default selection is *Autodetect*.

Note: We recommend that you leave all property value as default value unless the modification is really necessary. Autodetect will automatically select the appropriate speed for the Adaptec DuraLAN NIC you have installed.

---

5 Repeat Steps 3 and 4 for other existing ports as required.

6 Click **OK**.

Configuring the Ports in Windows NT 4.0

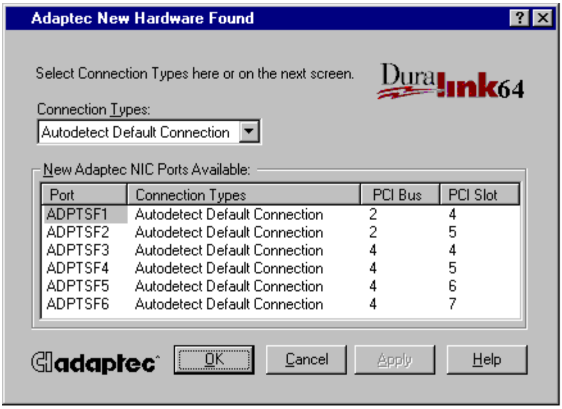
In the Adaptec New Hardware Found window, each port is assigned to *Autodetect*, the default connection type that will always detect port connection and negotiate a compatible speed and transmission mode.

To configure the Standalone driver ports in Windows NT 4.0 and select the connection type for your Adaptec DuraLAN NIC, follow these steps:

Note: If you are required to insert the Windows NT CD, you must reinstall the latest version of the Microsoft Windows NT Service Pack, then restart the system.

---

1 In the Adaptec New Hardware Found window, make sure all the DuraLAN NIC ports appear.



Adaptec New Hardware Found

Select Connection Types here or on the next screen.

Connection Types: Autodetect Default Connection

New Adaptec NIC Ports Available:

Port	Connection Types	PCI Bus	PCI Slot
ADPTSF1	Autodetect Default Connection	2	4
ADPTSF2	Autodetect Default Connection	2	5
ADPTSF3	Autodetect Default Connection	4	4
ADPTSF4	Autodetect Default Connection	4	5
ADPTSF5	Autodetect Default Connection	4	6
ADPTSF6	Autodetect Default Connection	4	7

2 In the New Adaptec NIC Ports Available box, select the appropriate port.

3 In the Connection Types field, select **Autodetect Default Connection** (The connection type will automatically be applied), or select the connection type for your network. For descriptions, see *Connection Types on page A-2*.

4 Repeat Steps 2 and 3 for each existing port.

5 Remove the CD and click **OK**.

6 When you are done, click **Close** in the Network window. See *Assigning the TCP/IP Address* on page 4-16.

7 At the Network Settings Change information box, click **Yes** to restart your system.

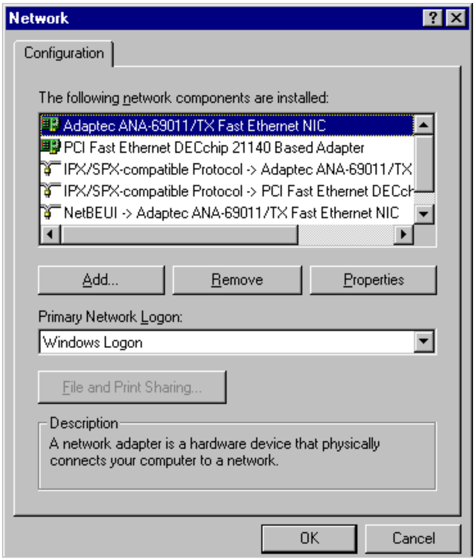
Configuring the Ports in Windows 98/Me

To configure ports in Windows 98/Me, follow these steps:

1 From the Start menu, point to **Settings,** and click **Control Panel**.

2 In the Control Panel, double-click **Network**.

3 In the Network window, click the appropriate DuraLAN NIC, and click **Properties**.



The following network components are installed:

Adaptec ANA-69011/TX Fast Ethernet NIC
PCI Fast Ethernet DECchip 21140 Based Adapter
IPX/SPX-compatible Protocol -> Adaptec ANA-69011/TX
IPX/SPX-compatible Protocol -> PCI Fast Ethernet DECch
NetBEUI -> Adaptec ANA-69011/TX Fast Ethernet NIC

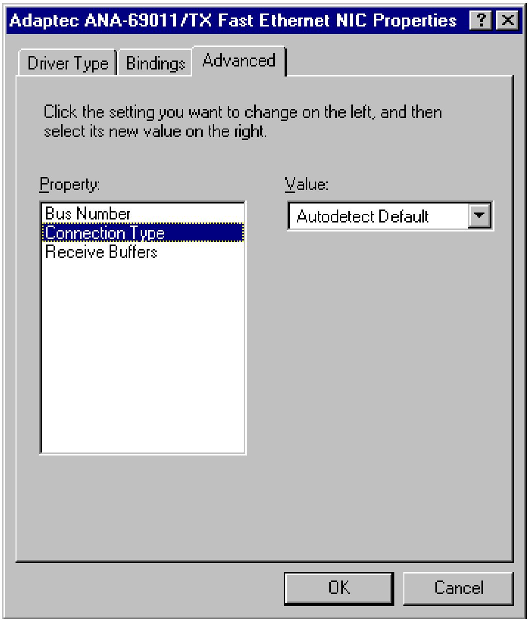
Primary Network Logon:
Windows Logon

Description
A network adapter is a hardware device that physically connects your computer to a network.

4 In the Properties window, click the **Advanced** tab.

5 In the Property box, click **Connection Type**.

6 In the Value list, select the appropriate connection type. (For descriptions, see *Connection Types on page A-2*.)


Adaptec ANA-69011/TX Fast Ethernet NIC Properties

Click the setting you want to change on the left, and then select its new value on the right.

Property:
Bus Number
Connection Type
Receive Buffers

Value:
Autodetect Default

7 Click **OK**.

8 In the Configuration tab, click **OK**.

9 Click the **Start** button, and select **Shut Down...** .

10 Restart the system.

Configuring the Ports for Duralink64 Failover

Configuring the Ports in Windows 2000/XP

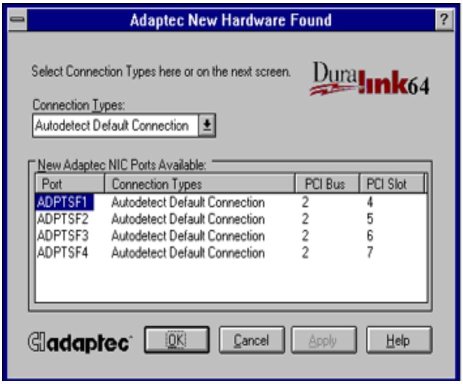
There is no need to configure the ports unless you want to change a specific property value (for example, connection type, receive buffers, and so forth). See *Note on DuraLAN NIC Ports* on page 4-2 to configure property value; otherwise, leave everything as default.

Configuring the Ports in Windows NT 4.0

In the Adaptec New Hardware Found window, each port is assigned to *Autodetect*, the default connection type that always detects port connection and negotiates a compatible speed and transmission mode.

To configure the ports in Windows NT 4.0, follow these steps:

1 In the Adaptec New Hardware Found window, make sure all the DuraLAN NIC ports appear.



Select Connection Types here or on the next screen.

Connection Types: Autodetect Default Connection

Port	Connection Types	PCI Bus	PCI Slot
ADPTSF1	Autodetect Default Connection	2	4
ADPTSF2	Autodetect Default Connection	2	5
ADPTSF3	Autodetect Default Connection	2	6
ADPTSF4	Autodetect Default Connection	2	7

Note: Generally, PCI Bus 0 is the PCI Bus on the motherboard. For example, PCI Bus 1 or above is an ANA-6*x*022 or ANA-6*x*044 NIC. The PCI Slot represents the port on the NIC starting from the top. The top port starts at PCI Slot 4.

2 In the New Adaptec NIC Ports Available window, available Adaptec ports are listed. Select the appropriate port, and click **Apply**.

3 From the Connection Types: drop-down list, select and click the connection type for your network—or select **Autodetect Default Connection**. The connection type will automatically be applied to the list of Ports below the Connection Type area. For descriptions, see *Connection Types* *on page A-2*.

4 Repeat Steps 2 and 3 for each existing port.

5 When you are done, click **OK**.

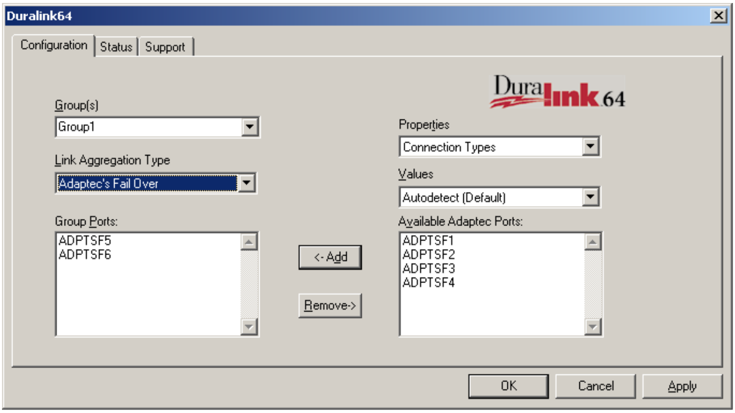
Creating the Failover Pair

You can create Failover pairs in the Configuration tab. A Failover pair consists of two ports only: the primary port and the backup port.

Configuring the Failover Pair in Windows 2000/XP

To create Failover pairs in Windows 2000/XP with GUI, follow these steps:

1. Start Windows 2000/XP.
2. From the Start menu, go to **Settings**, and click **Control Panel**.
3. In the Control Panel, double-click the **Adaptec Duralink** icon for the Duralink64 window.



Group(s): Group1

Link Aggregation Type: Adaptec's Fail Over

Group Ports:
ADPTSF5
ADPTSF6

Properties: Connection Types

Values: Autodetect (Default)

Available Adaptec Ports:
ADPTSF1
ADPTSF2
ADPTSF3
ADPTSF4

4. In the Group(s) field, click **Create New Group**, and type the name of the Failover group.

> **Note:** The group name may be up to 20 characters. If you skip this step, the system assigns a default group name (*GroupX*).

5. In the Link Aggregation Type field, select **Adaptec's Failover**.
6. The Available Adaptec Ports list shows all the network ports available in the system. From the Available Adaptec Ports list, select the appropriate port, and click **Add**.

7 To add the second port, repeat Step 6.

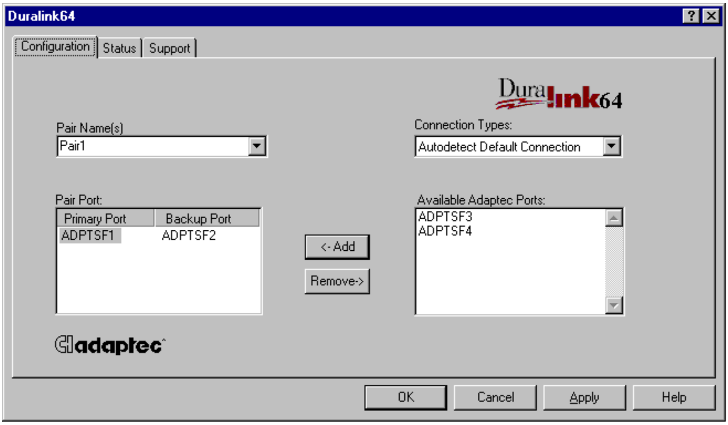
Note: To add multiple ports at one time, hold down the **Ctrl** key, select the appropriate ports, and click **Add**. Only two ports per group are supported for Failover.

To assign TCP/IP addresses to your ports, refer to *Assigning the TCP/IP Address* on page 4-16.

Configuring the Failover Pair in Windows NT 4.0

To create Failover pairs in Windows NT 4.0, follow these steps:

1 From the Available Adaptec Ports list, select the port to be designated as the primary port, and click **Add**. The port is added under Primary Port field in the Pair Port list.



Pair Name(s): Pair1

Connection Types: Autodetect Default Connection

Pair Port:

Primary Port	Backup Port
ADPTSF1	ADPTSF2

Available Adaptec Ports:
ADPTSF3
ADPTSF4

2 To assign a backup to the primary port, select the appropriate port from the Available Adaptec Ports list, and click **Add**. The port is added in the Backup Port list.

3 Click **Apply**.

4 OPTIONAL. Create another Failover pair by repeating Steps 1 through 3.

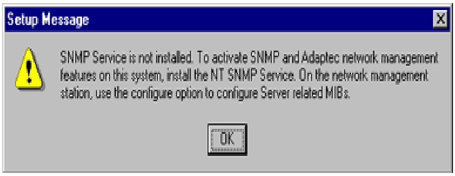
5 OPTIONAL. Remove a Failover pair by selecting the port from the Primary Ports list; then click **Remove**. Both ports return to the Available Adaptec Ports list. Click **Apply**.

6 When you are done, click **OK**. You will return to the Adapters tab of the Network window. <Backup NIC1> indicates that Port 2 is the backup port for Port 1.

Note: The Adapters tab identifies one model only, even when several DuraLAN NIC models are installed. The DuraLAN NIC model displayed is the same as the first model you chose in Step 8 during the driver installation.

7 When you are done, click **Close**. You will return to the Network Settings window.

8 If SNMP is not set up on your computer, you will receive the Setup Message below. Ignore the message, and click **OK**.



Setup Message

SNMP Service is not installed. To activate SNMP and Adaptec network management features on this system, install the NT SNMP Service. On the network management station, use the configure option to configure Server related MIBs.

9 Enter the protocol information. Consult your Microsoft Windows NT 4.0 documentation for help configuring the protocol (such as entering values for TCP/IP).

10 Remove the CD from the CD-ROM drive.

11 Restart the system.

Note: If you were required to insert the Windows NT CD, you must reinstall the latest version of Microsoft Windows NT Service Pack, then restart the system.

Monitoring Failover Pairs in Windows NT 4.0

There are three ways to monitor the status of the Failover pairs:

- **SNMP Manager**—When Failover occurs, SNMP traps are sent to network management stations and error logs are updated through the OS event log. In order to manage SNMP agents, compile the following .mib file on the SNMP management station:

  a:\snmpmibs\duralink.mib

- **Event Viewer Dialog Box**—The local Event Viewer dialog box will log port failures in Windows NT.
- **Duralink64 Failover Window**—The Status tab monitors the traffic and health of the Failover pairs.

Configuring Ports for Duralink64 Port Aggregation and FEC

Configuring the Ports in Windows 2000/XP

There is no need to configure the ports unless you want to change a specific property value (for example, connection type, receive buffers, and so forth). See *Note on DuraLAN NIC Ports* on page 4-2 to configure property value; otherwise, leave everything as default.

Wih Cisco's FEC, you can configure a minimum of two and a maximum of four ports (a Cisco limitation). A three-port configuration is not available—your options are either two or four ports.

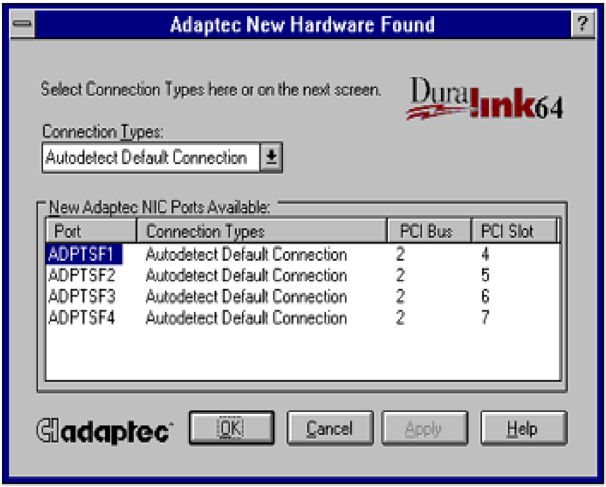
Configuring the Ports in Windows NT 4.0

In the Adaptec New Hardware Found window, each port is assigned to *Autodetect*, the default connection type that always detects port connection and negotiates a compatible speed and transmission mode.

Caution: This procedure is critical. Only one DuraLAN driver can exist in a system. If a DuraLAN Standalone driver, Duralink64 Failover driver, or Duralink64 Port Aggregation driver exists, remove it. See *Removing Previously Installed Drivers* on page 3-10.

To configure the ports in Windows NT 4.0, follow these steps:

1. In the Adaptec New Hardware Found window, make sure all the DuraLAN NIC ports appear.



Select Connection Types here or on the next screen.

Connection Types: Autodetect Default Connection

New Adaptec NIC Ports Available:

Port	Connection Types	PCI Bus	PCI Slot
ADPTSF1	Autodetect Default Connection	2	4
ADPTSF2	Autodetect Default Connection	2	5
ADPTSF3	Autodetect Default Connection	2	6
ADPTSF4	Autodetect Default Connection	2	7

Note: Generally, PCI Bus 0 is the PCI Bus on the motherboard. For example, PCI Bus 1 or above is an ANA-62022 or ANA-62044 NIC. The PCI Slot represents the port on the NIC starting from the top. The top port starts at PCI Slot 4.

2. In the New Adaptec NIC Ports Available list, select the appropriate port.
3. In this same field under the Connection Types: heading, click the connection type for your network or use **Autodetect Default Connection**. For descriptions, see *Connection Types on page A-2*.
4. From the Connection Types: drop-down list, select and click the connection type for your network—or select **Autodetect Default Connection**. The connection type will automatically be applied to the list of Ports below the Connection Types: area. For descriptions, see *Connection Types on page A-2*.
5. Click **Apply**.
6. Repeat Steps 2 through 4 for each existing port.
7. When you are done, click **OK**.

Creating Port Aggregation and FEC Groups

Port Aggregation with FEC Groups

FEC allows you to fully aggregate two or four ports over transmit and receive under all protocols. The ports that are configured as the FEC group must be physically connected to the FEC ports on the switch. If using a Cisco switch, see your Cisco switch documentation to configure the ports in FEC Mode.

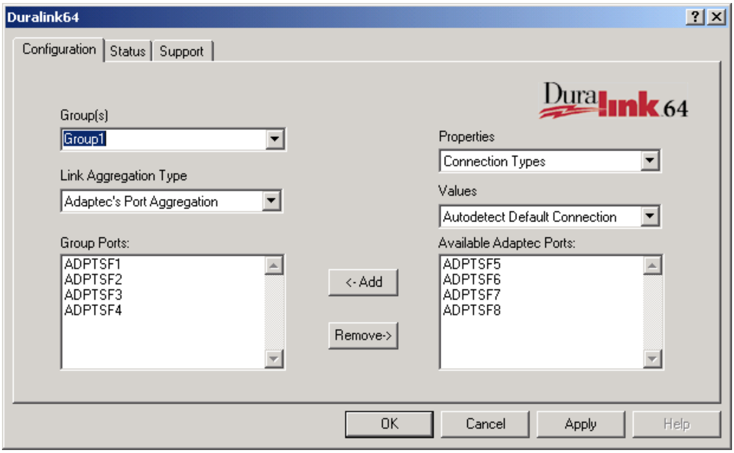
If you select FEC on the server, the connection type for each port is automatically configured to 100 Megabits / sec TX / Full Duplex. You must also configure the ports on the switch (used by the FEC group) to either Auto Negotiation or 100 Megabits / sec / Full Duplex Mode.

Keep in mind that with FEC, you can configure a minimum of two and a maximum of four ports (a Cisco limitation). A three-port configuration is not available.

Creating Port Aggregation or FEC Groups in Windows 2000/XP

To create Port Aggregation or FEC groups in Windows 2000 and Windows XP, both with GUI, follow these steps:

1. From the Start menu, point to **Settings**, and click **Control Panel**.
2. In the Control Panel, double-click the **Adaptec Duralink** icon.



Group(s): Group1

Link Aggregation Type: Adaptec's Port Aggregation

Group Ports:
ADPTSF1
ADPTSF2
ADPTSF3
ADPTSF4

Properties: Connection Types

Values: Autodetect Default Connection

Available Adaptec Ports:
ADPTSF5
ADPTSF6
ADPTSF7
ADPTSF8

3. In the **Group(s)** field, click **Create New Group**, and type the new group name.

> **Note:** The group name can be up to 20 characters. If you skip this step, the system assigns a default group name (*GroupX*).

4. In the Link Aggregation Type field, click the appropriate link type (in this procedure, click either **Adaptec's Port Aggregation** or **Cisco's Fast EtherChannel**). In the example in Step 2, Adaptec's Port Aggregation is selected in this field. For a brief description of Adaptec's Port Aggregation, see *Duralink64 Port Aggregation* on page 1-9. For Cisco's FEC, see *FEC (Fast EtherChannel)* on page 1-10.
5. From the Available Adaptec Ports box, select the available port you want to add to the group, and click **Add**.
6. Repeat Step 5 for each additional port.

> **Note:** We recommend that all ports in the same group be assigned the same Properties and Values (that is, Connection Type, Receive Buffers, and so on).

7. **OPTIONAL**. To remove a port from the group, select the appropriate port from the Group Ports box, and click **Remove**.
8. When you are finished configuring the group, click **Apply**.
9. To create another group, repeat Steps 3 through 8.
10. To rename a group:
    a. Select the group name in the Group(s) list box.
    b. Type the new name.
    c. Click **Apply**.
11. When you are finished configuring all groups, click **OK**.

To assign TCP/IP addresses to your ports, refer to *Assigning the TCP/IP Address* on page 4-16.

Creating Port Aggregation or FEC Groups in Windows NT 4.0

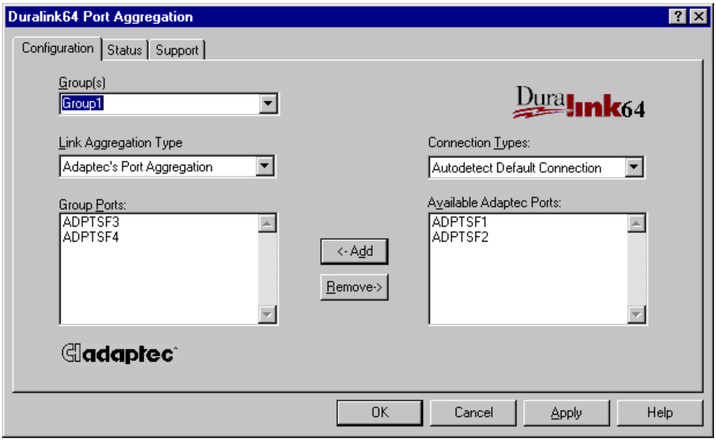
This section explains how to assign ports to a group while in Windows NT 4.0, and by doing so, creating a virtual port. If you have already installed Duralink64 Port Aggregation or FEC and wish to add or modify existing group or Standalone port configurations, see *Modifying Groups* on page 4-21.

To create Port Aggregation or FEC groups in Windows NT 4.0, follow these steps:

1 In the Group(s) field, click **Create New Group**, and type the new group name.

Note: The group name can be up to 20 characters. If you skip this step, the system assigns a default group name (*GroupX*).

.



Group(s): Group1

Link Aggregation Type: Adaptec's Port Aggregation

Connection Types: Autodetect Default Connection

Group Ports:
ADPTSF3
ADPTSF4

Available Adaptec Ports:
ADPTSF1
ADPTSF2

2 In the Link Aggregation Type field, click the appropriate link type. For a brief description of Adaptec's Port Aggregation, see *Duralink64 Port Aggregation* on page 1-9; for Cisco's FEC, see *FEC (Fast EtherChannel)* on page 1-10.

3 From the Available Adaptec Ports box, select the available port to add to the group, and click **Add**.

4 Repeat Step 3 for each additional port.

Note: We recommend that the same connection type be assigned to each port in the same group.

---

5 OPTIONAL. To remove a port from the group, click the appropriate port from the Group Ports box, and click **Remove**.

6 When you are finished configuring the group, click **Apply**.

7 To create another group, repeat Steps 1 through 6.

8 To rename a group:

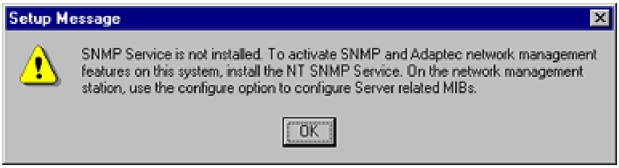
   a Select the first group name in the Group(s) list box.

   b Type the new name.

   c Click **Apply**.

9 When you are finished configuring all groups, click **OK**.

10 If SNMP is not set up on the computer, you will receive the Setup Message below. Ignore the message, and click **OK**.



SNMP Service is not installed. To activate SNMP and Adaptec network management features on this system, install the NT SNMP Service. On the network management station, use the configure option to configure Server related MIBs.

11 In the Network window, click **Close**.

To assign TCP/IP addresses to your ports, refer to *Assigning the TCP/IP Address* on page 4-16.

Assigning the TCP/IP Address

Assigning TCP/IP Address for Windows 2000/XP

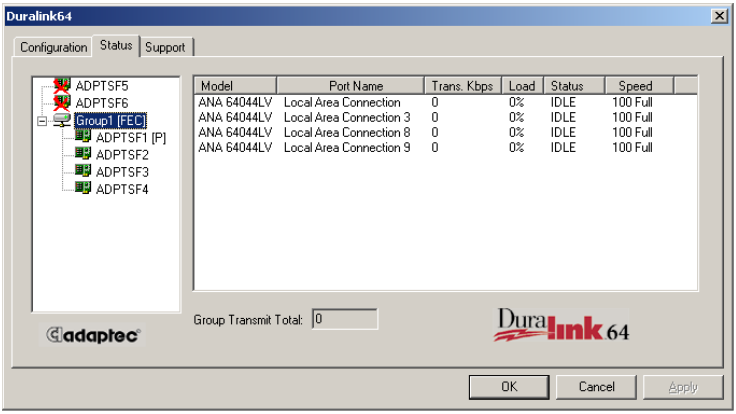
Once you have configured DuraLAN Failover, Port Aggregation, or FEC, you need to assign IP addresses to your primary ports. To identify the primary port for Link Aggregation Type (Failover, Port Aggregation, or FEC), follow these steps:

1 Click on **Start**.

2 From the Start menu, point to **Settings,** and click **Control Panel**.

3 In the Control Panel, double click the **Adaptec DuraLink** icon.

4 On the Duralink64 GUI, select the **Status** tab.



Model	Port Name	Trans. Kbps	Load	Status	Speed
ANA 64044LV	Local Area Connection	0	0%	IDLE	100 Full
ANA 64044LV	Local Area Connection 3	0	0%	IDLE	100 Full
ANA 64044LV	Local Area Connection 8	0	0%	IDLE	100 Full
ANA 64044LV	Local Area Connection 9	0	0%	IDLE	100 Full

Group Transmit Total: 0

5 Select the appropriate Group. The primary port will have a [P] next to it. To identify the primary Local Area Connection port, look under Port Name (all network settings will be taken from this port).

6 Click on **Start**.

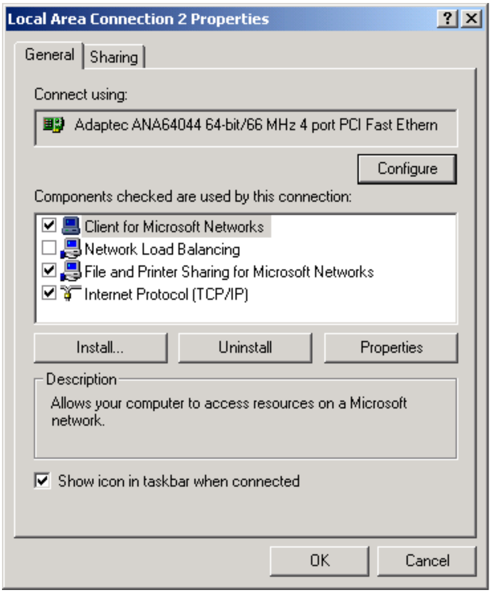
7 From the Start menu, point to **Settings,** and click **Control Panel**.

8 In the Control Panel, double click the **Network and Dial-up Connections** icon.

9 Right click on the appropriate **Local Area Connection** icon obtained from step 5, and select **Properties**.

Note: If a red “X” appears across the icon, it means that the network cable is unplugged or disconnected.

10 The Local Area Connection 2 Properties screen appears.



Connect using:

Adaptec ANA64044 64-bit/66 MHz 4 port PCI Fast Ethern

Components checked are used by this connection:

- ☑ Client for Microsoft Networks
- ☐ Network Load Balancing
- ☑ File and Printer Sharing for Microsoft Networks
- ☑ Internet Protocol (TCP/IP)

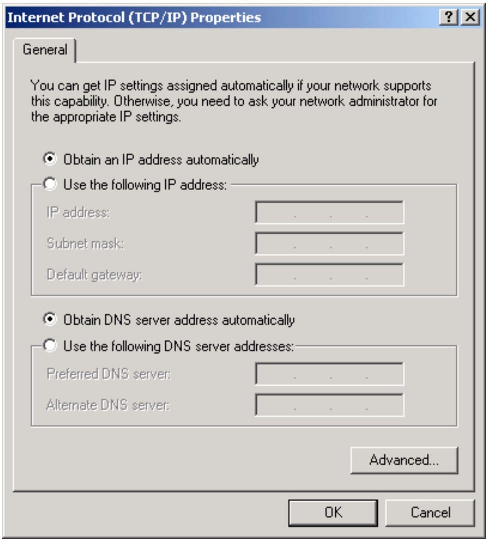
Description

Allows your computer to access resources on a Microsoft network.

☑ Show icon in taskbar when connected

11 Check the box for **Internet Protocol (TCP/IP)**.

12 Click **Properties**. The Internet Protocol (TCP/IP) Properties screen appears.



You can get IP settings assigned automatically if your network supports this capability. Otherwise, you need to ask your network administrator for the appropriate IP settings.

- ● Obtain an IP address automatically
- ○ Use the following IP address:

IP address: . . .

Subnet mask: . . .

Default gateway: . . .

- ● Obtain DNS server address automatically
- ○ Use the following DNS server addresses:

Preferred DNS server: . . .

Alternate DNS server: . . .

13 Select one of these options:

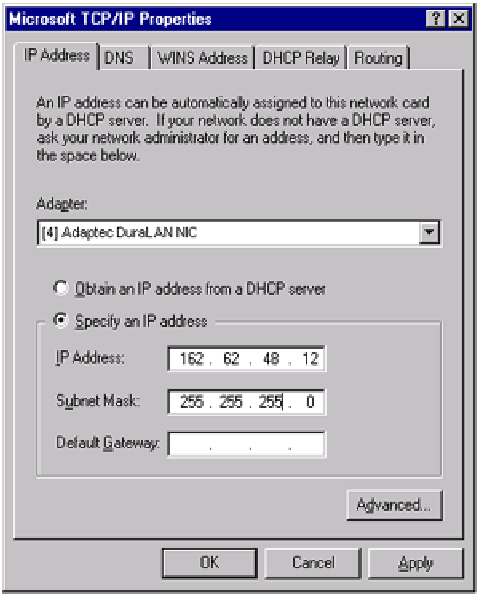
- **Obtain an IP address automatically**. The system can automatically obtain the IP address from a DHCP server.
- **Use the following IP address**. If your LAN system does not automatically assign IP addresses, you can manually assign the TCP/IP address and Subnet mask.
- **Use the following DNS server addresses**. Enter DNS server preferred and alternate addresses.

14 To assign an IP address to the next Adaptec NIC port, repeat Steps 3 through 8.

15 Click **OK**. This takes you back to the Local Area Connection Properties screen.

Assigning TCP/IP Address in Windows NT 4.0

Once you have configured Duralink64 Port Aggregation, Windows NT prompts you to configure the protocol. IP addresses to groups and standalone ports are assigned in the IP Address tab (such as those shown in the following figure). Ports assigned to a group use the same IP address; therefore, it must be entered only once.



An IP address can be automatically assigned to this network card by a DHCP server. If your network does not have a DHCP server, ask your network administrator for an address, and then type it in the space below.

Adapter: [4] Adaptec DuraLAN NIC

○ Obtain an IP address from a DHCP server

● Specify an IP address

IP Address: 162 . 62 . 48 . 12

Subnet Mask: 255 . 255 . 255 . 0

Default Gateway: . . .

To assign a TCP/IP address in Windows NT 4.0, follow these steps:

1. Click the **IP Address** tab.
2. From the Adapter drop-down list, select **Adaptec DuraLAN NIC**.
3. In the IP Address field, type the IP address.
4. In the Subnet Mask field, type the subnet mask number. You will be prompted to assign a different IP address for each port or group of ports. After all ports have been assigned an IP address, click **OK**.
5. Repeat Steps 1 through 4 for any other port or group.
6. When you are finished configuring all groups, click **OK.**
7. When prompted to restart your computer, click **Yes**.

Once Duralink64 Port Aggregation is installed, you can update group and port configurations using the instructions in *Modifying Groups* on page 4-21.

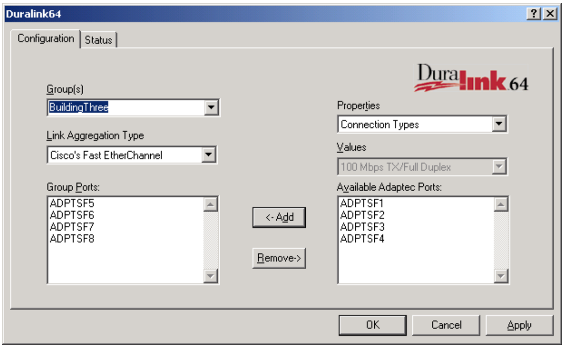
Modifying Groups

This section provides instructions for modifying the group or port configurations. You may rename groups as well as add or remove ports from existing groups.

Renaming Groups in Windows 2000/XP

To rename a group in Windows 2000/XP, follow these steps:

1 In the Duralink64 window, click the **Configuration** tab.



Group(s): BuildingThree

Link Aggregation Type: Cisco's Fast EtherChannel

Group Ports:
ADPTSF5
ADPTSF6
ADPTSF7
ADPTSF8

Properties: Connection Types

Values: 100 Mbps TX/Full Duplex

Available Adaptec Ports:
ADPTSF1
ADPTSF2
ADPTSF3
ADPTSF4

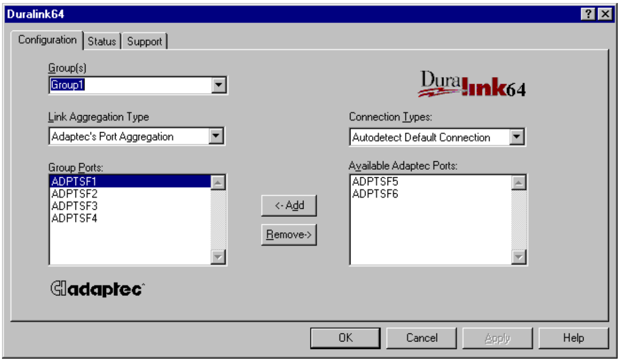
2 From the Group(s) field, select the appropriate group, and type the new name.

3 Click **Apply**.

Renaming Groups in Windows NT 4.0

To rename a group in Windows NT 4.0, follow these steps:

1 In the Duralink64 Port Aggregation window, click the **Configuration** tab.



Group(s): Group1

Link Aggregation Type: Adaptec's Port Aggregation

Group Ports:
ADPTSF1
ADPTSF2
ADPTSF3
ADPTSF4

Connection Types: Autodetect Default Connection

Available Adaptec Ports:
ADPTSF5
ADPTSF6

2. From the Group(s) field, select the appropriate group, and type the new name.
3. Click **Apply**.

Adding or Removing Ports in Windows 2000/XP

Note: If you add or remove a port to or from a group, any existing group or port IP address is removed automatically. Keep track of any IP addresses you plan to use again.

To add or remove ports in Windows 2000/XP, follow these steps:

1. In the Duralink64 window, click the **Configuration** tab.
2. In the Group(s) field, select the group you want to modify.
   - To add ports to the group, select the appropriate port from the Available Adaptec Ports: box, and click **Add**.
   - To remove ports from the group, select the appropriate port from the Group Ports: box, and click **Remove**.
3. Repeat Step 2 for each appropriate port.
4. To save changes, click **Apply**.
5. When you are finished, click **OK**.

Adding or Removing Ports in Windows NT 4.0

Note: If you add or remove a port to or from a group, any existing group or port IP address is removed automatically. Keep track of any IP addresses you plan to use again.

To add or remove ports in Windows NT 4.0, follow these steps:

1. In the Duralink64 Port Aggregation window, click the **Configuration** tab.
2. In the Group(s) field, select the group you want to modify.
   - To add ports to the group, select the appropriate port from the Available Adaptec Ports box, and click **Add**.

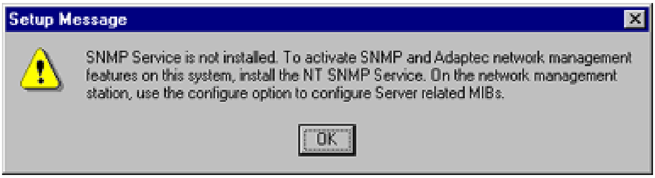
   - To remove ports from the group, select the appropriate port from the Group Ports box, and click **Remove**.

3 Repeat Step 2 for each appropriate port.

4 To save changes, click **Apply**.

5 When you are finished, click **OK**.

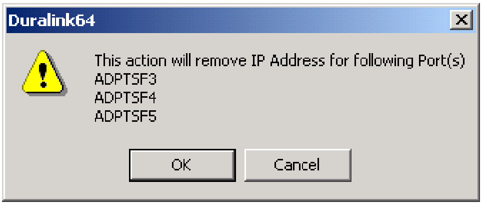
6 If SNMP is not set up on the computer, you will receive the Setup Message below. Ignore the message, and click **OK**.



SNMP Service is not installed. To activate SNMP and Adaptec network management features on this system, install the NT SNMP Service. On the network management station, use the configure option to configure Server related MIBs.

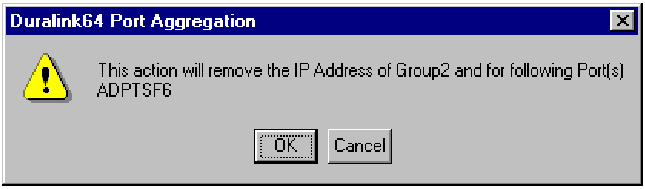
7 When adding or removing a group or port, you will receive a message such as the ones shown below. Click **OK**.

This message appears when you add ports with IP addresses to a new group.



This action will remove IP Address for following Port(s)
ADPTSF3
ADPTSF4
ADPTSF5

This message appears when you add ports with IP addresses to Group2 with an existing IP address.



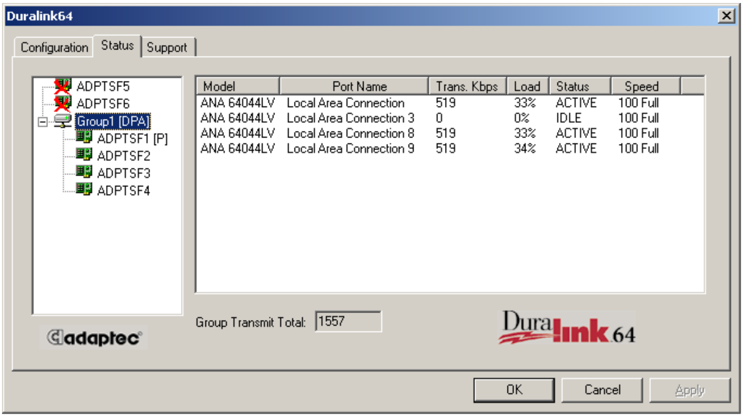
This action will remove the IP Address of Group2 and for following Port(s)
ADPTSF6

8 In the Network window, click **Close**.

Checking System Status in Windows 2000/XP

To view group and independent port status, follow these steps. See *Field Descriptions* on page 4-25 for details.

1. From the Start menu, point to **Settings**, and click **Control Panel**.
2. In the Control Panel, double-click **Adaptec Duralink** icon.
3. Click the **Status** tab to view the group and independent port information, as shown in the figure below.

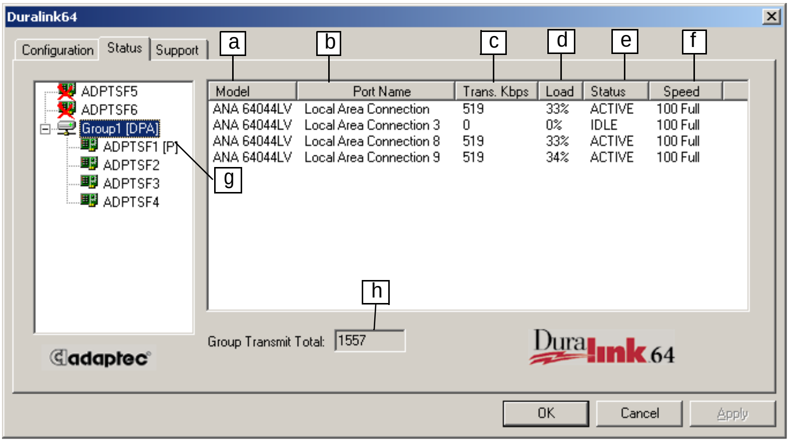


Model	Port Name	Trans. Kbps	Load	Status	Speed
ANA 64044LV	Local Area Connection	519	33%	ACTIVE	100 Full
ANA 64044LV	Local Area Connection 3	0	0%	IDLE	100 Full
ANA 64044LV	Local Area Connection 8	519	33%	ACTIVE	100 Full
ANA 64044LV	Local Area Connection 9	519	34%	ACTIVE	100 Full

Group Transmit Total: 1557

4. The primary port for each Group will have a [P] next to it.
5. Click **OK** to exit.

Understanding the Status Tab in Windows 2000/XP



Model	Port Name	Trans. Kbps	Load	Status	Speed
ANA 64044LV	Local Area Connection	519	33%	ACTIVE	100 Full
ANA 64044LV	Local Area Connection 3	0	0%	IDLE	100 Full
ANA 64044LV	Local Area Connection 8	519	33%	ACTIVE	100 Full
ANA 64044LV	Local Area Connection 9	519	34%	ACTIVE	100 Full

Group Transmit Total: 1557

Field Descriptions

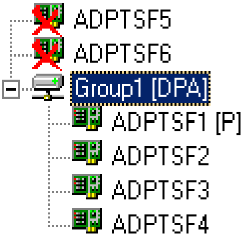
a	Model	Adaptec DuraLAN NIC model number.
b	Port Name	Local area connection assigned by the system.
c	Trans Kbps	Total kilobits per second (Kilobits/sec) transmitted per port (standalone and group). The Kilobits/sec sum of aggregated ports in a group equals the total Kilobits/sec transmitted by their group.
d	Load	The percentage of transmit load carried by each port in a group. The percentage of a standalone port is always 100%. The percentage for a group is calculated as a percentage of bytes transmitted by the port over bytes transmitted by the group during the last screen refresh interval.
e	Status	If the link is up and has transmitted data within the last screen refresh interval, ACTIVE is displayed. If the link is up but the port has not transmitted any data within the time interval, IDLE is displayed. If the link is down, DOWN is displayed.
f	Speed	Speed is either 10 or 100 in half or full duplex mode. This value depends on the connection type you chose in *Configuring the Ports in Windows 2000/XP* on page 4-11.
g	Primary Port	This is the primary port assigned to the group. All TCP/IP settings will be taken from this port.
h	Group Transmit Total	This field appears only when a group is selected in Port Aggregation mode.

Viewing the Groups

You can view the Groups list in two ways:

- Clicking a plus sign [+] next to port group will display the individual ports within a specific group.
- Clicking a minus sign [–] next to port group will hide the individual ports within a specific group.

Disabled ports are marked with a red X, such as ADPTSF5 shown below:

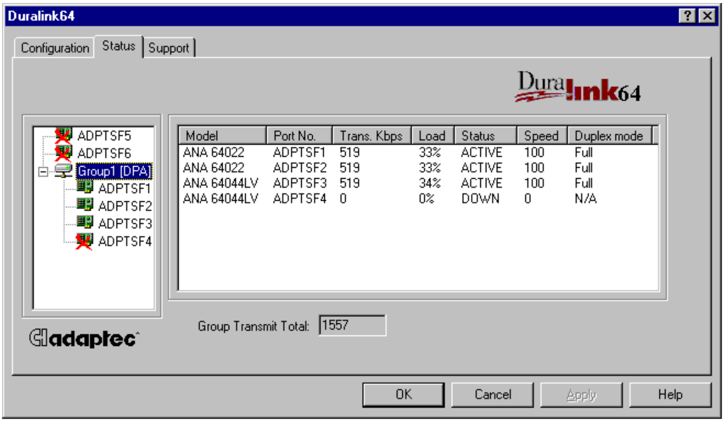


or [FEC]

Checking System Status in Windows NT 4.0

To view group and independent port status, follow these steps. See *Field Descriptions* on page 4-28 for details.

1. From the Start menu, point to **Settings**, and click **Control Panel**.
2. In the Control Panel, double-click **Network**.
3. In the Network window, click the **Adapters** tab.
4. In the Adapters tab, select and double-click **Adaptec DuraLAN NIC**. The Duralink64 Port Aggregation window appears.
5. Click the **Status** tab to view the group and independent port information, as shown in the figure below.

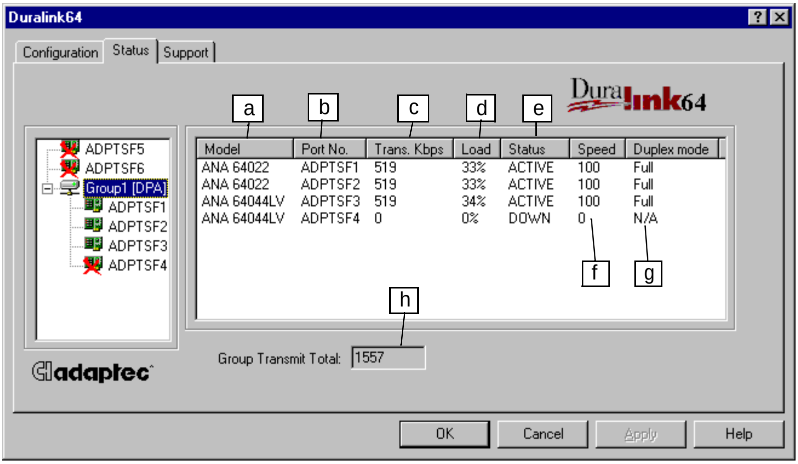


Model	Port No.	Trans. Kbps	Load	Status	Speed	Duplex mode
ANA 64022	ADPTSF1	519	33%	ACTIVE	100	Full
ANA 64022	ADPTSF2	519	33%	ACTIVE	100	Full
ANA 64044LV	ADPTSF3	519	34%	ACTIVE	100	Full
ANA 64044LV	ADPTSF4	0	0%	DOWN	0	N/A

Group Transmit Total: 1557

6. Click **OK** to exit.
7. Click **OK** to close the Network window.

Understanding the Status Tab in Windows NT 4.0



Model	Port No.	Trans. Kbps	Load	Status	Speed	Duplex mode
ANA 64022	ADPTSF1	519	33%	ACTIVE	100	Full
ANA 64022	ADPTSF2	519	33%	ACTIVE	100	Full
ANA 64044LV	ADPTSF3	519	34%	ACTIVE	100	Full
ANA 64044LV	ADPTSF4	0	0%	DOWN	0	N/A

Group Transmit Total: 1557

Field Descriptions

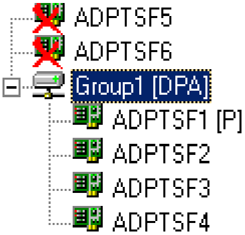
a	Model	Adaptec DuraLAN NIC model number.
b	Port No.	Port identification assigned by the system.
c	Trans Kbps	Total kilobits per second (Kilobits/sec) transmitted per port (standalone and group). The Kilobits/sec sum of aggregated ports in a group equals the total Kilobits/sec transmitted by their group.
d	Load	The percentage of transmit load carried by each port in a group. The percentage of a standalone port is always 100%. The percentage for a group is calculated as a percentage of bytes transmitted by the port over bytes transmitted by the group during the last screen refresh interval.
e	Status	If the link is up and has transmitted data within the last screen refresh interval, ACTIVE is displayed. If the link is up but the port has not transmitted any data within the time interval, IDLE is displayed. If the link is down, DOWN is displayed.
f	Speed	Speed is either 10 or 100. This value depends on the connection type you chose in *Configuring the Ports in Windows NT 4.0* on page 4-11.
g	Duplex Mode	Duplex mode is either half or full. This value depends on the connection type you chose in *Configuring the Ports in Windows NT 4.0* on page 4-11.
h	Group Transmit Total	This field appears only when a group is selected.

Viewing the Groups

You can view the Groups list in two ways:

- Clicking a plus sign [+] next to port group will display the individual ports within a specific group.
- Clicking a minus sign [–] next to port group will hide the individual ports within a specific group.

Disabled ports are marked with a red X, such as ADPTSF5 shown below:



or [FEC]

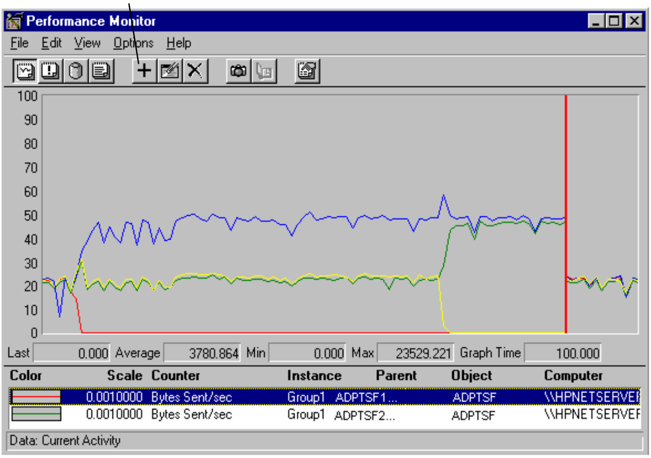
Windows NT/2000/XP Performance Monitor

You can view system traffic for selected groups and standalone ports in the Performance Monitor, as shown in the following figure. In this window, each line represents the performance of the group or port listed at the bottom of the screen. When a group / port's activity drops, its line drops.

To select ports and groups you wish to view, follow these steps:

1 From the Start menu, point to **Programs**, then to **Administrative Tools**, and click **Performance Monitor**. The

Performance Monitor example below is for Windows NT 4.0 only.



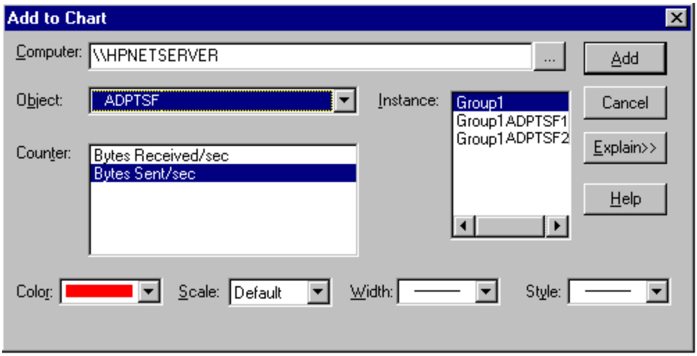
Add Counter

Last 0.000 Average 3780.864 Min 0.000 Max 23529.221 Graph Time 100.000

Color	Scale	Counter	Instance	Parent	Object	Computer
🟥	0.0010000	Bytes Sent/sec	Group1	ADPTSF1...	ADPTSF	\\HPNETSERVEF
🟩	0.0010000	Bytes Sent/sec	Group1	ADPTSF2...	ADPTSF	\\HPNETSERVEF

Data: Current Activity

2 In the Performance Monitor, click the **Add Counter** button, indicated in the Performance Monitor window shown in Step 1, to open the Add to Chart window. The Add to Chart example is for Windows NT 4.0 only (Windows 2000 and Windows XP are similar).



Computer: \\HPNETSERVER

Object: ADPTSF

Instance: Group1
Group1 ADPTSF1
Group1 ADPTSF2

Counter: Bytes Received/sec
Bytes Sent/sec

Color: 🟥 Scale: Default Width: —— Style: ——

Note: In Windows 2000 and Windows XP, the Failover, Port Aggregation, and FEC groups of ports will appear as a single port.

3 From the Object list box, select **ADPTSF**.

4. In the Instance box, select the port or group, and click the appropriate setting from the Counter box.
5. To distinguish ports and groups in the Performance Monitor, adjust the following parameters:
   - **Color**—is preset by the program for each selected group or port. You can set a specific color from the Color list box.
   - **Scale**—can be adjusted. You can set the scale of the plot for better viewing.
   - **Width**—allows you to set the width of the plot line.
   - **Style**—allows you to set the type of line that will be plotted for the selected group.
6. Repeat Steps 4 and 5 for each appropriate port or group.
7. When you are finished, click **Done**.

5

Duralink64 Drivers for NetWare

In This Chapter

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Installing the Duralink64 Driver during NetWare 4.x OS Installation (Not supported) 5-6

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Saving the Configuration 5-12

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Removing or Uninstalling Drivers 5-15

Notes on NetWare

When you are installing Adaptec DuraLAN NICs, it is a good idea to document where each port physically resides in the server—especially when two or more identical NICs exist. This is important since ports are identified by generic port names, such as Adptsf1, Adptsf2, Adptsf3, and so on.

Port names are assigned to ports in the order that the system scans these ports at boot time. Consequently, whenever you physically rearrange the network cards, the port names change as well.

Online Help is available from anywhere in NetWare's menu-driven dialog boxes during the configuration process. For help, just press **F1** from any area or any window during whatever process you are currently involved, and Help will appear to assist you.

After you install Duralink64 LAN driver software, use configsf to reconfigure the drivers for Standalone (SA), Failover (FO), Port Aggregation (PA), or FEC (Fast EtherChannel). (See *Modifying Driver Configurations* on page 5-15.)

Before You Begin

- Verify that all system, memory, and NIC requirements are met; see *System Requirements* on page 1-3.
- Verify that the new Adaptec DuraLAN NIC(s) have been installed properly in the server; see Chapter 2, *DuraLAN NIC Installation* on page 2-1.
- Check your system for installed Adaptec DuraLAN NIC drivers. If a Duralink64 Standalone driver, Duralink64 Failover driver, or Duralink64 Port Aggregation driver exists, it must be removed. For information about driver removal, see *Removing or Uninstalling Drivers* on page 5-15.

Note: For Novell NetWare, only one driver type may be configured at any one time.

Installing the Duralink64 Driver

In the following sections, aspects relating to driver installation are discussed.

HotPlug and NetWare 5.*x*/6.0

NetWare 5.*x* and 6.0 support HotPlug and HotReplacement on server systems that have HotPlug-compatible hardware. HotPlug allows you to add or remove a NIC to your server system without turning off your computer. Refer to the system's user guide for more complete and specific details of how the system performs while the HotPlug slot is in service or when it is not being used.

Note: Before you initiate HotPlugging or HotReplacement of a DuraLAN NIC, the following modules *must* be unloaded:

configsf.nlm
duralink.nlm
status.nlm
adptsf.lan

If you are HotPlugging or HotReplacing a NIC that is in an FO, PA, or FEC group, the entire group must be unloaded before HotPlug or HotReplacement can be performed (therefore, adptsf.lan must be unloaded first before running ncmcon.nlm).

The Duralink64 driver supports HotPlug / HotReplacement functionality in NetWare 5.*x* and 6.0. Two sets of modules are required for this function to work. The first set is the HotPlug modules provided by NetWare 5.x and 6.0; the other set is the HotPlug modules provided by the system IHV (Independent Hardware Vendor). For the latest Novell HotPlug modules, go to www.novell.com. For IHV HotPlug modules, go to the appropriate IHV Web site for the latest updates. Refer to the Novell user's manual for HotPlug modules and support.

HotPlug Support in SA Mode

In SA mode, using Novell Configuration Manager Console (ncmcon.nlm), follow the GUI onscreen options to HotPlug / HotReplace Adaptec's DuraLAN NICs. Either let Novell

NetWare's plug and play automatically load adptsf; or press **Esc** to load the NIC bindings manually (type:

```
load sys:\etc\configsf.ncf
```

or the user-defined ncf file).

HotPlug Support in FO, PA, or FEC Mode

To use HotPlug / HotReplacement in FO, PA, or FEC mode, load configsf using the Duralink64 driver CD or diskette. Configure FO, PA, or FEC, then save and install the drivers to the NetWare server. Once this is done, configsf will create a configuration file on the NetWare server (called configsf.ncf, located on sys:\etc) that contains all the appropriate settings for the mode you've selected. Next, follow these steps:

1. On the server, prompt unload status.nlm and duralink.nlm. (If the configsf GUI is running, exit the GUI.)
2. At the server prompt, initiate **unload adptsf** (which will unload all drivers and groups for the mode you've selected).
3. Launch the ncmcon.nlm HotPlug support module.
4. Select the Adaptec DuraLAN NIC to HotPlug or HotReplace, and follow the onscreen GUI instructions.
5. Insert the new Adaptec DuraLAN NIC in the same PCI slot as the one being swapped out, and press the PCI power switch / latch lever / button, used to power up the PCI slot.
6. Novell Configuration Manager (NCM) will prompt you by asking if you want to power this slot. Select **Yes**.
7. *Do not* let NCM automatically load the NIC drivers; instead, press **Esc** to avoid loading any NIC drivers.
8. Go to the server prompt and type:

   ```
   sys:\etc\configsf.ncf
   ```

   to load the FO, PA, or FEC driver settings, which will contain all previous networking settings—including TCP / IP, IPX number, name, network ID, bindings, and so on.

Installing the Duralink64 Driver during NetWare 6.0/5.*x* OS Installation

The procedures for installing NetWare 6.0, 5.1, and 5.0 are the same.

The Duralink64 driver is embedded only in the NetWare 5.1 installation CD.

Follow this procedure when installing the Duralink64 driver during the installation of NetWare 6.0/5.*x*. Install NetWare following the NetWare on-screen instructions until you reach the Network Boards screen.

> **Note:** If you are using the ANA-62011LV, ANA-64022LV, or ANA-64044LV NIC with NetWare 5.1, you must use the driver that came with the NIC. *Do not* use the driver embedded with NetWare 5.1.

1. Copy the NetWare driver files from the Duralink64 driver CD to a floppy disk before installing the drivers onto the server. *Do not* attempt to install Novell drivers from the CD during the OS installation.
   - **a** On a separate Windows PC, insert the Duralink64 driver CD into the CD-ROM drive and a blank DOS-formatted floppy disk into the floppy disk drive.
   - **b** Open the CD in Windows Explorer and double-click the **nwserver** directory (in the root of the CD).
   - **c** Select the entire contents of the **nwserver** directory, and copy it to the floppy disk.
   - **d** The floppy disk now contains the Duralink64 driver files and can be used to install drivers onto your NetWare server.
2. From the Network Boards window select **Modify**, and press **Enter**.
3. Select the **Network Boards** field, and press **Enter**.
4. If you are installing NetWare 5.*x* and are using the ANA-62011LV, ANA-64022LV, or ANA-64044LV NIC, you must remove the adptsf.lan driver that was autodetected and listed. Press **Delete** to remove the embedded driver.

5. Press **Insert**, then press **Insert** again.
6. Press **F3**. The Specify a Directory Path window appears.
7. Insert the floppy disk you created in Step 1 (with the Duralink64 drivers) into the floppy disk drive of the NetWare server, and press **Enter**.
8. Type `a:\nwserver` in the Directory Path box.
9. After the driver finishes loading, select **Return to Driver Summary**. Select only one instance of adptsf.lan, and delete all other instances.
10. Continue with the NetWare installation process.

Installing the Duralink64 Driver during NetWare 4.*x* OS Installation (Not supported)

Do not install the Duralink64 drivers until after the NetWare 4.*x* OS has been installed. Once this is accomplished, begin with the next section, *Installing the NetWare Driver after OS Installation*.

Installing the NetWare Driver after OS Installation

To install drivers for NetWare, follow these steps:

1. Insert the Duralink64 NetWare LAN driver CD into the CD-ROM.
2. Mount the CD-ROM, and refer to NetWare documentation (as per your specific OS).
3. To run the config program, type the name of the CD volume followed by `\nwserver\configsf`. For example, type

   ```
   load duralink64v52:\nwserver\configsf
   ```

   and press **Enter**.
4. When the Duralink64 screen appears, select the **Install Software** option, and press **Enter**.

Note: If a dialog box appears requesting to overwrite any files, press **F5** to overwrite all previous files.

Installing the NetWare Port Aggregation and Failover Drivers

If you are installing NetWare 6.0 or 5.*x* on a new server, please see *Installing the Duralink64 Driver during NetWare 6.0/5.x OS Installation* on page 5-5.

Note: This driver uses 64 receive buffers for each port. Therefore, if you are using multiple ports, the number of receive buffers must be increased. Type

```
load edit c:\nwserver\startup.ncf
```

then type the following commands at the *end* of the file:

```
set minimum packet receive buffers = 2000
set maximum packet receive buffers = 10000
```

To install the Failover or Port Aggregation driver for NetWare, follow these steps:

1. Insert the Duralink64 NetWare CD into the CD-ROM.
2. Mount the CD-ROM, refer to NetWare documentation (as per your specific OS). To display the CD volume name, type the volume at the console prompt.
3. To run the config program, type the name of the CD volume followed by `\nwserver\configsf`. For example, type

   ```
   load duralink64v52:\nwserver\configsf
   ```

   and press **Enter**.
4. When the Duralink64 screen appears, select the **Install Software** option, and press **Enter**.

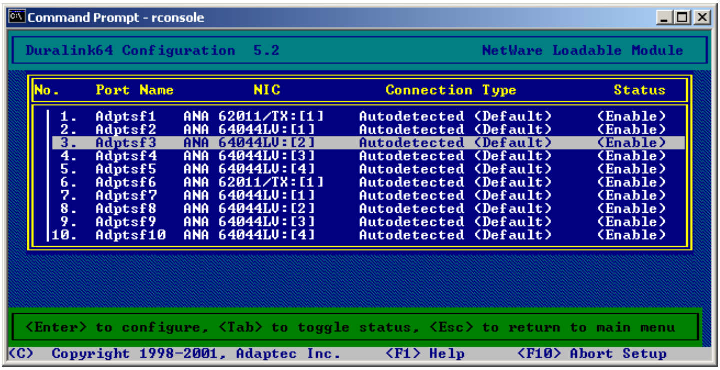
Note: If a dialog box appears requesting to overwrite any files, press **F5** to overwrite all previous files.

Configuring the Ports

To configure the ports, follow these steps:

1. From the Main Menu, select **Link Aggregation Type**, select **Configure Ports**, and press **Enter**.

2 In the Ports screen, make sure you know which port names are assigned to the actual ports on the NIC. The port names (Adptsf1, Adptsf2, and so on) do not correspond to the physical PCI slot numbers on the motherboard.

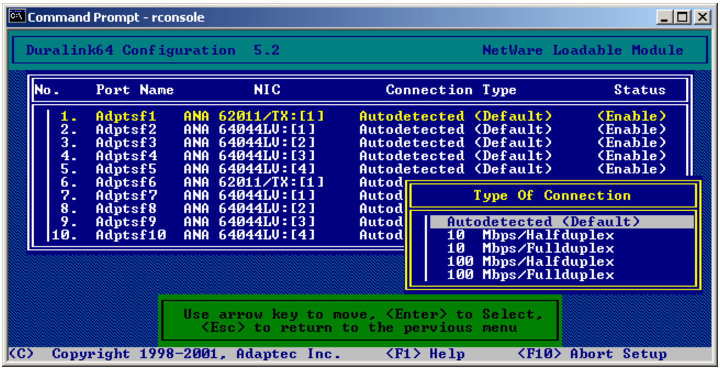


```
Duralink64 Configuration  5.2                      NetWare Loadable Module

No.    Port Name       NIC            Connection Type            Status

  1.   Adptsf1    ANA 62011/TX:[1]  Autodetected (Default)      <Enable>
  2.   Adptsf2    ANA 64044LV:[1]   Autodetected (Default)      <Enable>
  3.   Adptsf3    ANA 64044LV:[2]   Autodetected (Default)      <Enable>
  4.   Adptsf4    ANA 64044LV:[3]   Autodetected (Default)      <Enable>
  5.   Adptsf5    ANA 64044LV:[4]   Autodetected (Default)      <Enable>
  6.   Adptsf6    ANA 62011/TX:[1]  Autodetected (Default)      <Enable>
  7.   Adptsf7    ANA 64044LV:[1]   Autodetected (Default)      <Enable>
  8.   Adptsf8    ANA 64044LV:[2]   Autodetected (Default)      <Enable>
  9.   Adptsf9    ANA 64044LV:[3]   Autodetected (Default)      <Enable>
 10.   Adptsf10   ANA 64044LV:[4]   Autodetected (Default)      <Enable>

 <Enter> to configure, <Tab> to toggle status, <Esc> to return to main menu
<C>  Copyright 1998-2001, Adaptec Inc.     <F1> Help      <F10> Abort Setup
```

3 **Optional**. The Autodetected (Default) detects which device the port is connected to and negotiates the port speed and transmission mode accordingly. The Autodetected connection type is recommended; however, to change connection type(s):

a Select the port, and press **Enter**.

b In the Type of Connection menu, select the type, and press **Enter**. (*Connection Types on page A-2* provides descriptions.)



```
Duralink64 Configuration  5.2                      NetWare Loadable Module

No.    Port Name       NIC            Connection Type            Status

  1.   Adptsf1    ANA 62011/TX:[1]  Autodetected (Default)      <Enable>
  2.   Adptsf2    ANA 64044LV:[1]   Autodetected (Default)      <Enable>
  3.   Adptsf3    ANA 64044LV:[2]   Autodetected (Default)      <Enable>
  4.   Adptsf4    ANA 64044LV:[3]   Autodetected (Default)      <Enable>
  5.   Adptsf5    ANA 64044LV:[4]   Autodetected (Default)      <Enable>
  6.   Adptsf6    ANA 62011/TX:[1]  Autod
  7.   Adptsf7    ANA 64044LV:[1]   Autod      Type Of Connection
  8.   Adptsf8    ANA 64044LV:[2]   Autod
  9.   Adptsf9    ANA 64044LV:[3]   Autod   Autodetected (Default)
 10.   Adptsf10   ANA 64044LV:[4]   Autod   10  Mbps/Halfduplex
                                            10  Mbps/Fullduplex
                                            100 Mbps/Halfduplex
                                            100 Mbps/Fullduplex

            Use arrow key to move, <Enter> to Select,
               <Esc> to return to the pervious menu
<C>  Copyright 1998-2001, Adaptec Inc.     <F1> Help      <F10> Abort Setup
```

c Repeat steps **3a** and **3b** until all ports have been configured

4 **Optional**. *Enabled* is the default status. To disable a port, select the port, and press **Tab**.

5 Press **Esc** when you are done.

Creating the Failover Pair, Port Aggregation or FEC Groups

The Failover pair consists of only two ports: the primary port and the backup port.

FEC supports either two or four ports. One, three, or more than four ports are not supported.

After configuring ports, you may create Standalone, Failover, Port Aggregation, or FEC groups using the following steps:

1. In the Configuration Menu, select **Set Groups**, and press **Enter**.
2. In the List of Existing Groups box, press **Ins** to add a new group. The message No groups currently exist appears the first time you add a new group[1].
3. Select the group, and press **Enter**. *Group1* is the new group's default name.
4. In the Group Configuration menu, select **Set Group Type**, and press **Enter.** The Set Group Type menu appears**.**
5. In the Set Group Type menu, select **Standalone**, **Failover**, **Port Aggregation**, *or* **Fast EtherChannel**, and press **Enter**.
6. In the Group Configuration menu, select **Add/Remove Ports**, and press **Enter**. The Existing Ports box appears.
7. In the Existing Ports box, the message No Ports Present appears the first time you add a new group. Press **Ins**.
8. In the Available Ports box, use the **arrow keys** to select the ports for the new group, and press **Enter**. Repeat until all ports are selected.
9. Press **Esc** to return to the Group Configuration menu. The selected ports are transferred to the Existing Ports box.
10. **OPTIONAL.** configsf automatically assigns a name to each new group. For example, the first group = Group1. To assign a unique name to a group:
    a. From the Group Configuration menu, select **Set Group Name**, and press **Enter**.

---

[1] If you are in configsf, this message appears only when no groups are found.

   b In the Group Name box, type the group name, and press **Enter**. (This field allows up to 20 characters.)

11 To create another group, repeat Steps 2 through 10.

12 Press **Esc** until you return to the Main Menu.

13 Select **Exit**, then **Save and Quit**.

Assigning the Protocols

You can assign IP or IPX protocols to Failover pairs and Standalone ports.

Note: The IPX protocol supports all four frame types and multiple-frame types simultaneously. IP protocol supports either Ethernet_II or Ethernet_SNAP, but not both at the same time.

To assign a protocol, follow these steps:

1 In the Main Menu, select **Link Aggregation Type**, then select **Configure Protocols**. Press **Enter**.

2 In the Existing Ports box, select a group, and press **Enter**.

3 In the List of Protocols box, select the protocol for the selected Group, and press **Enter**.

If you selected **IPX**, continue with Step 4.

If you selected **IP**, skip to Step 5.

4 To assign an IPX protocol, follow these steps:

   a In the List of Frame Types box, select the frame type, and press **Enter**.

   b In the IPX Network Number box, type the network number, and press **Enter**.

   c Repeat Steps 4a and 4b for each frame type you wish to use. A check mark will appear after the name of the frame type used.

   d Press **Esc** to return to the List of Protocols box, then skip to Step 6.

5 To assign an IP protocol, follow these steps:

  a In the List of Frame Types box, select the frame type, and press **Enter**.

  b In the IP Parameters box, select **Enter IP Address**, and press **Enter**. The IP Address box appears.

  c In the IP Address box, type the IP address number, and press **Enter**.

  d In the IP Parameters box, select **Enter Subnet Mask**, and press **Enter**.

  e In the Subnet Mask box, type the corresponding subnet mask, and press **Enter**.

  f Press **Esc**.

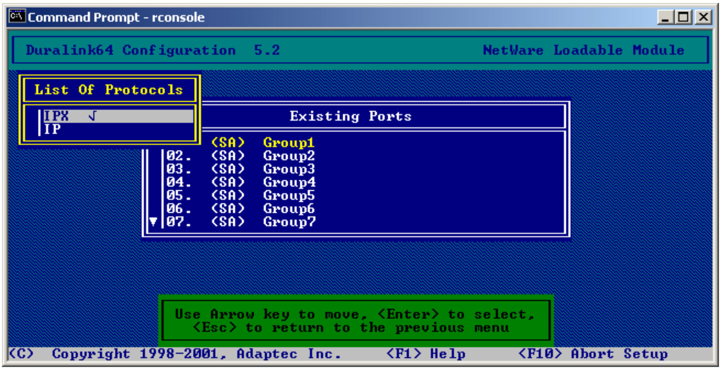
  g Repeat Steps a through f for each appropriate port or pair.

  h Press **Esc** until you return to the List of Ports / Failover Pairs box.

6 Repeat Steps 1 through 5 for any other Groups you wish to configure.

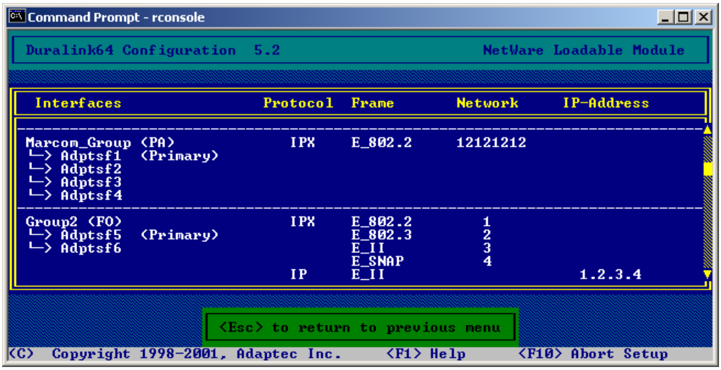
7 Press **Esc** until you return to the Main Menu.

As an example, following are the overlapping dialog boxes viewed while assigning the protocols in NetWare.



```
Command Prompt - rconsole

 Duralink64 Configuration  5.2                     NetWare Loadable Module

  List Of Protocols
  IPX   √
  IP                                 Existing Ports
                          (SA)   Group1
                  02.     (SA)   Group2
                  03.     (SA)   Group3
                  04.     (SA)   Group4
                  05.     (SA)   Group5
                  06.     (SA)   Group6
                ▼ 07.     (SA)   Group7

                  Use Arrow key to move, <Enter> to select,
                    <Esc> to return to the previous menu
<C>  Copyright 1998-2001, Adaptec Inc.     <F1> Help      <F10> Abort Setup
```

When the preceding selection is executed, the following display appears listing the protocols available in this example configuration.



```
 Duralink64 Configuration  5.2                         NetWare Loadable Module

  Interfaces                     Protocol  Frame        Network     IP-Address
 ---------------------------------------------------------------------------
 Marcom_Group (PA)                 IPX     E_802.2      12121212
  └> Adptsf1   (Primary)
  └> Adptsf2
  └> Adptsf3
  └> Adptsf4
 ---------------------------------------------------------------------------
 Group2 (FO)                       IPX     E_802.2         1
  └> Adptsf5   (Primary)                   E_802.3         2
  └> Adptsf6                               E_II            3
                                           E_SNAP          4
                                   IP      E_II                       1.2.3.4

                        <Esc> to return to previous menu
<C>  Copyright 1998-2001, Adaptec Inc.     <F1> Help       <F10> Abort Setup
```

Saving the Configuration

Once you have established and verified all port and group configurations in configsf, you are ready to save the configuration file to the server.

To save the configuration to the server, follow these steps:

1 In the Main Menu, select **Exit**, and press **Enter**.

2 In the Save Configuration box, select **Save and Quit** to save the configuration. The following line,

```
sys:\etc\configsf.ncf
```

will be added to the autoexec.net file.

- – If you do not want to save the changes, select **Quit without Saving**, and press **Enter**.
- – If you wish to return to the Main Menu, select **Return to Main Menu**, and press **Enter**.

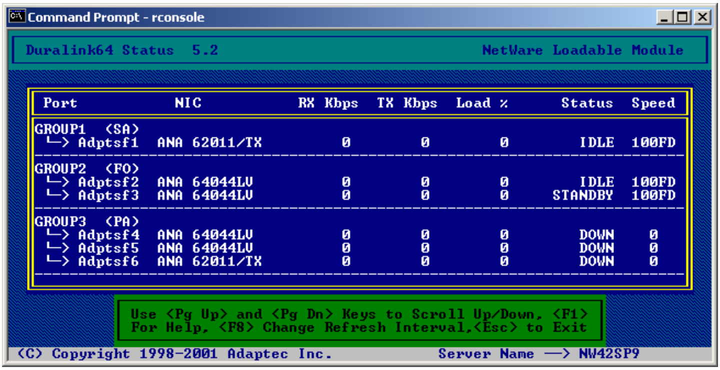
3 Restart the server to load the new configuration.

Viewing System Status

Once you have installed Duralink64 Port Aggregation using configsf, you can view the system status in the System Status screen. This program opens automatically whenever you restart the server.

To manually enter the Status screen, at the system prompt type:

```
load status
```



```
Duralink64 Status  5.2                              NetWare Loadable Module

 Port               NIC              RX Kbps   TX Kbps   Load %      Status  Speed
GROUP1  (SA)
 └─> Adptsf1  ANA 62011/TX                0         0        0        IDLE  100FD
----------------------------------------------------------------------------------
GROUP2  (FO)
 └─> Adptsf2  ANA 64044LU                 0         0        0        IDLE  100FD
 └─> Adptsf3  ANA 64044LU                 0         0        0     STANDBY  100FD
----------------------------------------------------------------------------------
GROUP3  (PA)
 └─> Adptsf4  ANA 64044LU                 0         0        0        DOWN    0
 └─> Adptsf5  ANA 64044LU                 0         0        0        DOWN    0
 └─> Adptsf6  ANA 62011/TX                0         0        0        DOWN    0
----------------------------------------------------------------------------------

      Use <Pg Up> and <Pg Dn> Keys to Scroll Up/Down, <F1>
      For Help, <F8> Change Refresh Interval,<Esc> to Exit
 (C) Copyright 1998-2001 Adaptec Inc.            Server Name ──> NW42SP9
```

System Status Data

- Adaptec NIC model number.
- Total Kilobits/sec transmitted per port (Standalone and Group). Total Kilobits/sec transmitted per group. The Kilobits/sec sum of aggregated ports in a group equals the total Kilobits/sec transmitted by their group.
- Percentage of transmit load carried by each port in a load-balancing group. The percentage for a standalone port is always 100 percent. The percentage for a group is calculated as a percentage of bytes transmitted by the port over bytes transmitted by the group for a fixed period of time. (Use **F8** to adjust time intervals.)
- The present status of all ports and groups.
    - **DOWN** is displayed when a link is down.
    - **ACTIVE** is displayed when the link is up and has transmitted data within the established time interval.
    - **IDLE** is displayed when the link is up, but the port has not transmitted any data within the established time interval.
- Speed of active ports and groups.

Setting Time Intervals

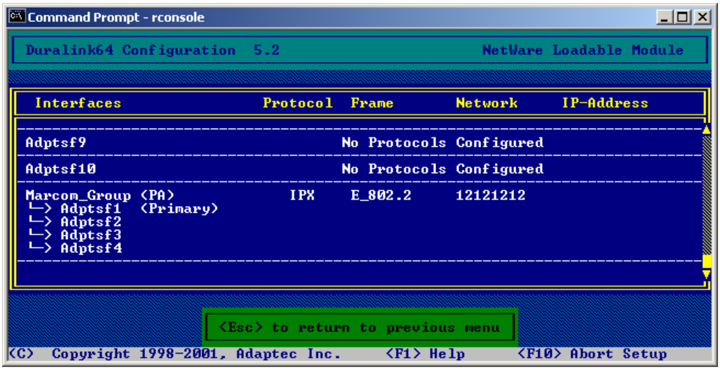
By default, the System Status screen refreshes every second. You may change the time interval using **F8**.

Verifying Configuration

You should verify the current port configurations before saving them to the server.

To verify the configuration, follow these steps:

1 From the Main Menu, select **Link Aggregation Type**, then select **View Configuration**. Press **Enter**. The View Configuration screen appears.



```
Duralink64 Configuration   5.2                        NetWare Loadable Module

 Interfaces                          Protocol  Frame        Network      IP-Address
------------------------------------------------------------------------------------
Adptsf9                                      No Protocols Configured
------------------------------------------------------------------------------------
Adptsf10                                     No Protocols Configured
------------------------------------------------------------------------------------
Marcom_Group (PA)                    IPX       E_802.2      12121212
 └─> Adptsf1   (Primary)
 └─> Adptsf2
 └─> Adptsf3
 └─> Adptsf4
------------------------------------------------------------------------------------

                         <Esc> to return to previous menu
<C>  Copyright 1998-2001, Adaptec Inc.      <F1> Help       <F10> Abort Setup
```

In this example the screen indicates that five standalone ports without configurations and one group named Marcom are currently enabled.[1] Marcom is made up of three ports: Adptsf1, Adaptsf2, and Adapts3. The IPX protocol is assigned to Marcom using ETHERNET_802.2 as the frame type and 121212121 as the IPX Network Number.

2 Press **Esc** to return to the Main Menu.

---

[1] If the ports or group were disabled, **[Disabled]** would appear next to the port/group name.

Modifying Driver Configurations

Once Duralink64 Standalone, Failover, Port Aggregation, or FEC is installed, use configsf to add, remove, or change a driver configuration for an Adaptec DuraLAN NIC.

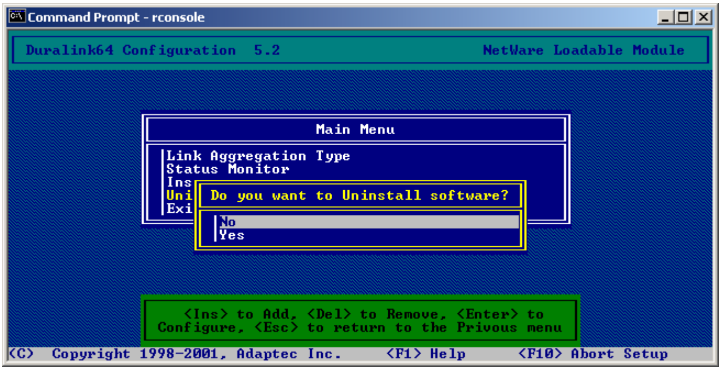
To modify driver configurations, follow these steps:

1. At the system console prompt, type `load configsf`, and press **Enter**.
2. Once you have opened configsf, refer to *Configuring the Ports* on page 5-7 for more instructions.

Removing or Uninstalling Drivers

If a new driver must be installed to replace an existing driver, follow these steps:

1. At the system prompt, type `load configsf`, and press **Enter**.
2. At the Main Menu, select **Uninstall Software**, and press **Enter**.



```
Duralink64 Configuration  5.2                    NetWare Loadable Module

                    Main Menu
          Link Aggregation Type
          Status Monitor
          Ins
          Uni  Do you want to Uninstall software?
          Exi
               No
               Yes

        <Ins> to Add, <Del> to Remove, <Enter> to
       Configure, <Esc> to return to the Privous menu
<C>  Copyright 1998-2001, Adaptec Inc.     <F1> Help      <F10> Abort Setup
```

3. Select **Yes**. The computer will begin to remove files.
4. Select **Exit**.
5. On the Save Configuration box, select **Quit Without Saving**.
6. At the system prompt, type `restart server`, and press **Enter**.

6

Installing Duralink64 Novell Client

In This Chapter

Installing Novell Client32 for DOS 6-1

Installing Novell Client32 for Windows 6-3

Installing Novell Client32 for DOS

This section describes how to install the Adptsf 32-bit driver for Novell Client32 using the ODI (Open Data-Link Interface) driver. Please note that DuraLAN products do not support 16-bit drivers.

1. Download the latest version of Novell NetWare Client32 via the Novell Web site, www.novell.com.
2. Start DOS.
3. Insert your Novell NetWare Client32 package.
4. Type `install`, then press **Enter**.
5. Follow the instructions on your screen. Refer to *Selecting Options* on page 6-2 if you are not sure which option to select.

When you are done, you may confirm settings in startnet.bat.

Note: This installation setup assigns settings to only one port. To assign settings to multiple ports, you must edit startnet.bat. See *Editing startnet.bat* on page 6-2.

Selecting Options

This section provides the option you must select in a given screen. These screens vary depending on which NetWare Client32 package you are using.

Screen Name/Message	Option
Client Installation	Select either **NetWare Client32 for DOS and Windows 3.1x** or **IntraNetWare DOS/ Windows for DOS/Windows**.
Driver Type	Select **32-Bit**.
32-Bit Network Board Drivers	Select **User Specified 32 Bit Driver**. *Do not* choose Adaptec PCI Ethernet Driver Failover.
When asked to insert the NetWare Client32 for DOS / Windows 3.1x 32-bit CD	Insert the Duralink64 driver for NetWare (CD), and type `a:\nwserver`.
32-Bit Network Board Drivers	Select **Adaptec DuraLAN Network Adapters**.
Settings for Adaptec DuraLAN Network Adapter	Set IOMAP to **1**. Set Connection Type to **Autodetect Default** or **None**.

Editing startnet.bat

To assign multiple ports, follow these steps:

1 Load c:\novell\client32\adptsf.lan.

2 In startnet.bat, type `slot=[port slot number]` at the end of each line. The following example shows the setting assigned to port 1:

```
iomap=1 frame=ETHERNET_802.2 slot=1
```

3 For the next port, type

```
iomap=1 frame=[frame type] slot=[port slot
number]
```

To assign multiple frame types, repeat this step, changing the frame type setting.

4 Repeat Step 3 for each additional port.

5. Save your changes.
6. Exit startnet.bat.

Connecting Clients to the NetWare Server

Connecting clients to the NetWare Duralink64 server requires the NDIS driver. *Do not* use an ODI driver (see *Connecting Clients to the NetWare SA, FO, PA, or FEC Server* on page 6-4).

Installing Novell Client32 for Windows

This section describes how to install the Adptsf 32-bit driver for Novell Client32. Please note that Adaptec does not support 16-bit drivers.

Note: This procedure requires the NDIS driver with Client32. *Do not* use an ODI driver.

1. If you are using Windows NT 4.0, install the latest Microsoft service packs that are available for the Windows OS. Then restart the system.
2. Install the DuraLAN Standalone driver. Instructions are provided in *Installing the Duralink64 Driver during NetWare 6.0/ 5.x OS Installation* on page 5-5.
3. Install the Client32 software, see your Novell documentation for instructions.

Connecting Clients to the NetWare Server

Connecting clients to the NetWare Duralink64 server requires the NDIS driver. *Do not* use an ODI driver. See the appropriate section:

- *Installing the NetWare Driver after OS Installation* on page 5-6.
- *Installing the NetWare Port Aggregation and Failover Drivers* on page 5-7.

Connecting Clients to the NetWare SA, FO, PA, or FEC Server

For optimum performance of NetWare Duralink64 Failover, all clients (any brand) should increase their IPX retry count.

- For DOS clients using VLM or Novell Client32

  Type the following lines in `edit net.cfg` (indenting the second line as shown here):

  ```
  protocol ipx
    ipx retry count = 255
  ```

- For Windows 95 Clients using Novell Client32

  From the Control Panel, locate NetWare Clients, and type `255` under the IPX retry count in the IPX 32-bit Protocol tab.

- For Windows NT Clients using Novell Client32

  Follow these steps to set the IPX retry count in the registry in NetWare Workstation Parameters:

  a From the DOS prompt, type `regedit` to enter the Registry Editor.

  b Double-click **hkey_local_machine**.

  c Double-click **System**.

  d Double-click **CurrentControlSet**.

  e Double-click **Services**.

  f Double-click **NetWare Workstation**.

  g Double-click **Parameters**.

  h Double-click **Retry Count** to enter the Edit DWORD Value menu.

  i Change the base to decimal, then change value data to `255`.

  j Click **OK**.

  k Close the Registry Editor.

  l Restart the system.

7

Duralink64 Standalone Driver for UnixWare

In This Chapter

Before You Begin 7-1

Special Notes for UnixWare 7-2

Installing the Standalone Driver on UnixWare 7.x 7-2

Assigning the Protocols 7-3

Viewing the Configuration 7-3

Restarting the Server 7-4

Removing Drivers 7-4

Before You Begin

- Verify that all system, memory, and NIC requirements are met; see *System Requirements* on page 1-3.
- Verify that the new Adaptec DuraLAN NIC(s) have been installed properly in the server; see Chapter 2, *DuraLAN NIC Installation* on page 2-1.
- Check your system for installed Adaptec DuraLAN NIC drivers. If a Duralink64 Standalone (Standard) driver exists, it must be removed. For information about driver removal, see *Removing Drivers* on page 7-4.

Special Notes for UnixWare

When you are installing Adaptec DuraLAN NICs, it is a good idea to document where each port physically resides in the server—especially when two or more identical NICs exist.

Installing the Standalone Driver on UnixWare 7.*x*

To install the Standalone driver for UnixWare 7.*x* (which includes UnixWare 7.1.*x*), follow these steps:

1. Insert the UnixWare 7.*x* driver CD into the CD-ROM drive.
2. Log on to the UnixWare 7.*x* CDE as the root user.
3. Open the dtterm console.
4. Mount the CD-ROM by typing the following command after the prompt (#):

   ```
   mount -F cdfs –r /dev/cdrom/cdrom1 /mnt
   ```

   Then press **Enter**.
5. Again at the prompt, type

   ```
   pkgadd -d /mnt/uw7x/duralan.pkg
   ```

   and press **Enter** to add the package (driver).
6. Run `netcfg` to open the Network Configuration Manager window.
7. Go to the Hardware menu.
8. Select **Add new LAN adapter**.
9. Select **Ethernet-Adaptec DuraLAN NIC Driver**, then select **Continue**.
10. Select **Advanced Options**, and select the appropriate speed. (The default speed is AutoNegotiation.)
11. Select **OK**. The Add Protocol window will appear.
12. At the Add Protocol options menu, select the desired protocol (**IPX/SPX** or **TCP/IP**), and click **Add**.
13. Enter the network configuration, and click **OK**.
14. Click **OK** once more to finish the configuration process.

15. Repeat Steps 8 through 14 for additional LAN configurations.
16. To exit, click **Hardware**, then select **Exit**.

Assigning the Protocols

To assign IP or IPX protocols to standalone ports, follow these steps:

Note: The IPX protocol supports all four frame types and multiple-frame types simultaneously. IP protocol supports either Ethernet_II or Ethernet_SNAP, but not both at the same time. Adding IPX/SPX requires a system reboot.

1. Select **Add Protocol** from the Network Configuration Manager menu.
2. From the Protocol menu, select **IPX/SPX** or **TCP/IP**.
3. Click **Add**.
4. Enter the network configuration, and click **OK**. Repeat Steps 1 through 3 for each additional protocol.

Viewing the Configuration

It is important to verify the current port configurations before saving them to the server.

To verify the current port configurations, follow these steps:

1. Select the **Protocol** option from the Network Configuration Manager menu, and press **Enter**.
2. Select **View Protocol Configuration**.
3. If the setup is correct, click **OK**.
4. To exit, click **Hardware**, then select **Exit**.

Restarting the Server

After installing the Standalone driver and configuring the ports, you must restart the server. If loading only TCP/IP, a reboot is not required.

To restart the server, follow these steps:

1 Login as root, and open a ddterm console.

2 Enter the following at the console prompt (#):

```
cd /
```

and press **Enter**.

3 Then, again following the prompt, type

```
shutdown –y –i6 –g0
```

and press **Enter**.

4 The server restarts.

Removing Drivers

Before the new driver can be installed, the older driver must be removed. To install a new driver that replaces an existing driver, follow these steps:

1 Login as root. Open a console prompt, and type:

```
pkgrm DuraLAN
```

(Note: this entry is case sensitive), and press **Enter**.

2 The system asks you

```
Do you want to remove this package? [Yes,No,?,quit]
```

At the prompt, type `y` for yes or `n` for no, and press **Enter**.

3 The system removes the selected driver.

Note: If you simply type `pkgrm` at the prompt, you must then select the driver you wish to remove from a list of all drivers currently on your server. In this case, you would select **DuraLAN** from this list and continue with the process as outlined in this section.

A

Cables and LEDs

This section is not intended to be an exhaustive explanation of connecting Ethernet networks but will provide some useful information on cabling suitable for Adaptec DuraLAN NICs.

The following table outlines the two cable specifications of IEEE 802.3u: 100BaseTX and 100BaseFX.

	100BaseTX	**100BaseFX**
Cable supported	CAT 5 UTP	62.5/125 multimode fiber
Number of cable pairs	2	1
Node-to-repeater cabling distance	100 meters	137 meters
Node-to-switch to full duplex	100 meters	2000 meters

Connection Types

Here are some of the possible connection type options given when configuring NICs. The options vary depending upon which operating system the NIC is being configured.

- Autodetect Default Connection

  Detects the cable type, optimal line speed, and duplexity for the specific Adaptec PCI NIC model in use. This is the default and recommended connection type.

- 10 Megabits / sec UTP / Half Duplex

  Forces the connection to 10 Megabits / sec in Half Duplex Mode.

- 100 Megabits / sec TX / Half Duplex

  Forces the connection to 100 Megabits / sec in Half Duplex Mode.

- 10 Megabits / sec UTP / Full Duplex

  Forces the connection to 10 Megabits / sec in Full Duplex Mode.

- 100 Megabits / sec TX / Full Duplex

  Forces the connection to 100 Megabits / sec in Full Duplex Mode.

Full Duplex Support

To implement Full Duplex on your network, you need both an NIC and a switch that supports Full Duplex. Full Duplex support allows an NIC to send and receive data at the same time, doubling available bandwidth.

Note: Full Duplex can also be enabled point-to-point with a crossover cable instead of a switch.

Installation instructions in this *User's Guide* describe how to enable Full Duplex. Additional information can be found in the readme.txt files. Adaptec PCI TX NICs support Full Duplex at both 10 Megabits / sec and 100 Megabits / sec.

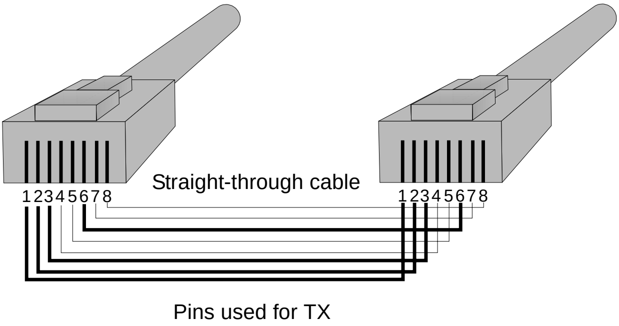
Cable Requirements

Cable requirements for Adaptec DuraLAN NICs vary according to network speed, cabling standard, and the connector to be used. The table below identifies appropriate cabling, based on these variables. The table applies to both Half Duplex and Full Duplex (for selected models) environments.

NIC	Connector	10 Megabits/sec	100 Megabits/sec	Cable Pins Used
TX Adapters	RJ-45	CAT 3,4,5 UTP	CAT 5 UTP	1,2,3, 6
FX Adapters	ST	N/A	62.5/125 micron multimode fiber	N/A
	SC	N/A	62.5/125 micron multimode fiber	N/A

Straight-through Cables

The majority of twisted-pair environments use twisted-pair cables that are wired straight-through. This means that each pin of the modular plug connector is wired to the same pin on the opposite end of the cable (pin 1 is wired to pin 1). Straight-through cables connect workstations and servers to repeaters and switches. Cables for 100BaseTX use two pairs (pins 1, 2, 3, and 6).

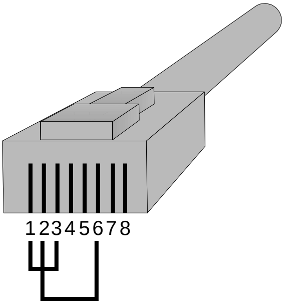


Pin-out and Color Requirements

Straight-through Cable – 10BaseT or 100BaseTX	
Pin	**Colors – Both Ends**
1	Orange / White
2	Orange
3	Green / White
4	Blue
5	Blue / White
6	Green
7	Brown / White
8	Brown

Diagnostics Loop-back Cable

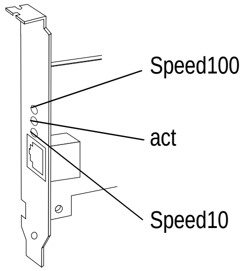
The following pin-outs are used for diagnostics external and autonegotiation tests. Refer to *Diagnostic Tests* on page D-2 for more information regarding diagnostic tests.



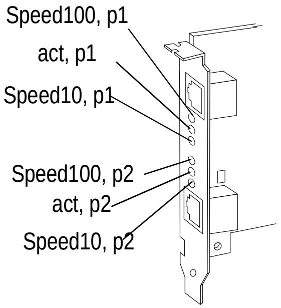
Loop-back cable

Diagnostic LEDs

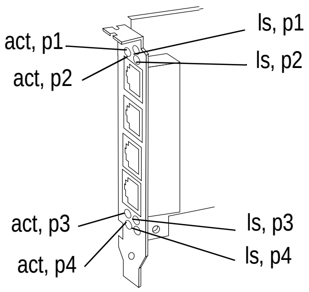
Diagnostic Light Emitting Diodes (LEDs) provide information about link status and network activity. The figure below shows the locations of LEDs for each board. See the descriptions on the following page for details on each LED display.



ANA-6*x*011



ANA-6*x*022



ANA-6*x*044

act = network activity, p = port, ls = link status

LED Functions

For ANA-6*x*011, and ANA-6*x*022:

- Speed100

  The Speed100 LED is green. When on, it indicates that a valid 100 Megabits/sec link has been made.

- Speed10

  The Speed10 LED is green. When on, it indicates that a valid 10 Megabits/sec link has been made. When off, no 10 Megabits/sec link has been made.

- act

  The act LED is amber. The act LED lights up to signal the presence of incoming or outgoing traffic.

For ANA-6*x*044:

- ls

  When on and green, it indicates that a valid 100 Megabits / sec link has been made. When on and amber, it indicates that a valid 10 Megabits / sec link has been made. When off, no valid link has been made.

- act

  The act LED is amber. The act LED lights up to signal the presence of incoming or outgoing traffic.

B

Troubleshooting Tips

This appendix explains how to troubleshoot problems with your DuraLAN NIC. If your NIC is not functioning properly, first make sure that it was set up according to the instructions in this *User's Guide*.

- Verify that your NIC is installed properly and configured correctly; see Chapter 2, *DuraLAN NIC Installation* on page 2-1.
- Verify that your network is properly cabled and the NIC is properly connected; see *Connecting the Network Cable* on page 2-4 and Appendix A, *Cables and LEDs* on page A-1.
- Verify that the DuraLAN driver is installed correctly; see Chapter 2, *DuraLAN NIC Installation* on page 2-1.
- Verify that you are using the latest BIOS for your computer and the latest DuraLAN driver.
- Verify that your cable, terminators, and connectors are functioning properly, or install the NIC in a different slot.

Isolating Faulty Hardware

If your problem persists, try the following:

- Replace the NIC with the same type of Adaptec NIC that is known to work. If the new NIC functions properly, the problem is related to the original NIC.
- Install the NIC in another functioning computer, and run the tests again. If the NIC works in this machine, the problem is related to one of three areas:
  - The computer is faulty
  - There is a hardware conflict
  - There are problems with the cables or connectors

Troubleshooting

Use the following table to help answer common questions. For more information on FAQs, see the www.adaptec.com support site.

Symptom	Solution
Adaptec NIC is conflicting with an installed PCI SCSI Adapter	Configure the NIC and SCSI adapters to use different interrupts via BIOS, System Configuration Utility (SCU), or EISA Configuration Utility (ECU) provided by the system vendor.
Workstations cannot connect to the NetWare server	Make sure the workstation and server are using the same frame type. Add the following two lines to the NetWare Server startup.ncf file: set minimum packet receive buffers=512 set maximum packet receive buffers=1024 For Failover and Port Aggregation NetWare servers, verify that IPX retry count = 255 is on each workstation. See *Connecting Clients to the NetWare SA, FO, PA, or FEC Server* on page 6-4.
Error messages during NetWare driver installation	Install NetWare Service Pack 6 (iwsp6) or later, select **ODI 3.31 specification**, then install the DuraLAN NIC driver.

Symptom *(Continued)*	Solution
Driver fails to load or fails to recognize the DuraLAN NIC	Check the BIOS settings. Sometimes the bus master is disabled by default; if this is the case, enable the bus master.
Persistent problems with an adapter card set to IRQ 15	This occurs in Novell's NetWare. Either disable IRQ 15 or change the Adaptec DuraLAN NIC to another interrupt. Please refer to your Novell documentation.
System hangs at boot up	Make sure the DuraLAN NIC is seated properly in the PCI slot. Check with your system vendor for the latest BIOS.
LED does not light when running autonegotiation in the Diagnostics utility	Use a loop-back cable; see *Diagnostics Loop-back Cable* on page A-4.

Configuring the BIOS

Your system BIOS *may* determine available NIC resources and configure the Adaptec PCI NICs automatically. However, depending on your system, you may need to configure the PCI BIOS. To do this, enter your computer BIOS Setup and select **Advanced Settings** from the Main Menu. Make sure the following settings are made (your BIOS may not match the following options exactly):

Option	Setting
PCI Slot Enabled	Enable all PCI slots in your system.
Bus Mastering	Enable PCI bus mastering for the slot(s) to be used by the NIC(s).
PCI INTA	For the 62011 / TX, assign an interrupt (10, 11, 12, and so on) to PCI Interrupt Vector A.
PCI INTA-B	For the 6*x*022, assign an interrupt (10,11, 12, and so on) to PCI Interrupt Vector A or B.
PCI INTA-D	For the 6*x*044, assign an interrupt (10,11, 12, and so on) to PCI Interrupt Vector A–D.
PCI Bus Latency	Set to a value between 40 and 80.

Two- and four-port NICs use a PCI-to-PCI bridge chip. If your system BIOS does not support the PCI-to-PCI bridge chip, these NICs will not be configured properly. Contact your computer manufacturer to obtain a new BIOS version that supports the PCI-to-PCI bridge chip.

Frequently Asked Questions

Duralink64 Software and DuraLAN NICs – General Questions

- ***What is Duralink64 v5.x software?***

  Adaptec's innovative Duralink64 software includes Duralink64 standard drivers, Port Aggregation, and Failover. This software is supported by Adaptec's DuraLAN 32-bit and 64-bit NICs. Duralink64 Port Aggregation software makes it possible to aggregate the outbound bandwidth of 2 to 12 Fast Ethernet ports into one virtual network interface for up to 1.2 Gigabits/sec of total throughput per workgroup. Duralink64 Failover Software offers FDDI-like port resiliency for optimum availability, and safe, fault-tolerant Fast Ethernet networks.

- ***How do the standard drivers, Port Aggregation, and Failover differ?***

  The Duralink64 standard driver is the minimum software required for DuraLAN NICs. Duralink64 Port Aggregation software groups up to 12 Fast Ethernet ports onto a single aggregated connection operating up to 1.2 Gigabits/sec per workgroup. Duralink Failover software is an application that automatically reacts to preserve a network connection if an Ethernet link fails.

- ***Which Adaptec NICs support the Duralink64 v5.x software suite?***

  Adaptec's Duralink64 standard, Port Aggregation, and Failover drivers are supported by the ANA-6*x*011/TX, ANA-6*x*022, and ANA-6*x*044.

- ***Can I use the Adaptec Duralink64 v5.x software with NICs from other vendors?***

  Duralink64 v5.x software works only with Adaptec PCI 10/100 DuraLAN NICs, but it is fully interoperable with products from other vendors.

- ***Which protocols work with Duralink64 v5.x software and my DuraLAN NICs?***

  TCP/IP and NetBEUI under Windows NT 4.0 and Windows 2000, and TCP/IP and IPX/SPX under NetWare.

- ***Does Duralink64 v5.x software or the DuraLAN NICs support AppleTalk?***

  No.

- ***Does Duralink64 v5.x or my DuraLAN NIC support routing?***

  Routing functionality is provided by network OSs, and not by NICs themselves. The NIC can be used with server OSs (like Novell's NetWare, Windows NT, and Windows 2000) that support routing.

- ***What is the difference between the Duralink64 v4.2 or 5.0 and Duralink v3.0 software?***

  Duralink64 v4.2 and v5.0 are the software drivers written for Adaptec's DuraLAN ASIC (used on the ANA-6*x*011/TX, ANA-6*x*022, and ANA-6*x*044). Duralink v3.0 is the software written for Adaptec's legacy NICs based on the DEC/Intel ASICs (used on the ANA-6911A/*XX*, ANA-6922A/*XX*, and ANA-6944A and B/*XX*.

- ***Can I use the Duralink64 v5.x software with the legacy Adaptec DEC-based NICs?***

  No. The Duralink64 v5.x software is written only for the new Adaptec DuraLAN NICs and will not support the legacy Adaptec DEC-based NICs. You can use both cards in one system if you load both the Duralink64 v4.*x* or v5.*x* and Duralink v3.0 software. However, you cannot mix and match Adaptec legacy DEC-based cards and Adaptec DuraLAN cards in a single Port Aggregation or Failover group.

Duralink64 v5.x Failover Software Questions

- ***What is Duralink64 Failover software?***

  Duralink64 Failover software is a network device application that automatically reacts to preserve a network connection when an Ethernet link fails. Duralink64 Failover supports mission-critical applications by activating a standby link in the event of failure, providing increased uptime and maintaining server availability. The driver establishes an active and a hot-standby link. Once the active link goes down, the standby link becomes active. The standby link is activated when the following conditions occur on the primary link:

  - link loss,
  - the driver loses contact with the NIC's *keep alive* mechanism,
  - an abnormal hardware interrupt occurs,
  - the port becomes unable to transmit for a specified time, or
  - abnormal send and receive counters occur, such as too many collisions or errors on the segment.

- ***Which protocols work with Duralink64 Failover?***

  TCP/IP and NetBEUI under Windows NT and Windows 2000, and TCP/IP and IPX/SPX under NetWare.

- ***Is Duralink64 software interoperable/compatible with other vendors' NICs and network devices?***

  Duralink software only works with Adaptec DuraLAN NICs but is fully interoperable with network devices (such as switches and hubs) from other vendors.

- ***Does Duralink64 Failover work with a switch or a hub?***

  Duralink64 Failover works with any switch or any hub.

- ***How many ports can I configure for the Failover group?***

  Two ports per Failover group. Within each group, only one port can be used as the primary or active port, and only one port can be used as the backup or standby port.

- ***What happens during Failover?***

  The driver momentarily halts data transmission, does error checking, transfers the MAC address of the primary port to the backup port, enables the backup port for data transmissions, and continues to transmit data on the backup port.

- ***If I have the Duralink64 standard drivers installed and want to install the Failover drivers, what do I need to do?***

  You must uninstall or remove the Duralink64 standard drivers, and reboot the system. Then you can install the Duralink64 Failover drivers.

Duralink64 v5.x Port Aggregation Software Questions

- ***What is Duralink64 Port Aggregation software?***

  Adaptec's Duralink64 Port Aggregation technology builds upon standards-based Fast Ethernet to provide network managers a reliable high-speed solution for the network backbone. Duralink64 Port Aggregation software groups up to 12 Fast Ethernet ports onto a single aggregated connection operating up to 1.2 Gigabits/sec per workgroup. See the Port Aggregation white paper on the Adaptec Web site (http://www.adaptec.com).

- ***What are the key benefits of Duralink64 Port Aggregation software?***

  – Network scalability

  – Increases bandwidth by adding ports

  – Allows segmentation of the network as needed by grouping ports

  – Adds fault tolerance by design

- ***What applications or environments call for Duralink64 Port Aggregation?***

  Applications or environments that require Duralink64 Port Aggregation include servers that have large numbers of clients or download large amounts of data, such as application and video servers.

- ***How does Duralink64 Port Aggregation work?***

  For all protocols, Duralink64 Port Aggregation effectively distributes transmit traffic among all ports within a Port Aggregation group. The Duralink64 Port Aggregation driver assigns a primary port to the Port Aggregation group, and the protocol binds to that port. To the protocol, the primary port is the only port. However, the driver uses all the ports in the group to transmit packets to the clients. Packets are generally received by the server via the primary port; but in the case of NetBEUI, all ports receive and transmit.

  Duralink64 Port Aggregation requires connection to a switch in order for the ports to be aggregated as one logical link.

- ***How does the Failover portion of Duralink64 Port Aggregation work?***

  Network fault tolerance means that a specific portion of the network is able to tolerate a failure. Fault tolerance is a built-in feature of the Duralink64 Port Aggregation product since there are at least two contributing members of each Port Aggregation group. It is highly improbable that the server connection will fail in this context.

  If one port fails, the duties associated with the failed port are redistributed to other members of the Port Aggregation group. If the primary port fails, another member of the group is assigned the primary port's MAC address, minimizing impact to routers and their routing tables. If the primary port comes back online, the primary port's address is reassigned back to the primary port.

- ***What NICs support Duralink64 Port Aggregation?***

  Adaptec's ANA-6*x*011/TX, ANA-6*x*022, and ANA-6*x*044 NICs support Duralink64 Port Aggregation.

- ***Which network switches support Duralink64 Port Aggregation?***

  Duralink64 Port Aggregation has been tested with all the leading vendors' switches. Duralink64 Port Aggregation requires connection to a switch in order for the ports to be aggregated as one logical link.

- ***Which protocols and OSs work with Duralink64 Port Aggregation?***

  Adaptec's Port Aggregation driver works with TCP/IP and NetBEUI under Windows NT and TCP/IP and IPX/SPX under NetWare.

- ***Does Duralink64 Port Aggregation support multiple VLANs?***

  Only one VLAN is supported per aggregated group or per port.

- ***How does Duralink64 Port Aggregation compare to Cisco's Fast EtherChannel?***

  Both Duralink64 Port Aggregation and Cisco's FEC are proprietary. Cisco's FEC focuses on increasing bandwidth between Cisco switches while Adaptec's Port Aggregation focuses on increasing bandwidth between server and switch connections, to increase server availability to clients. Each port on Cisco's FEC module can be configured to FEC Mode or Fast Ethernet Mode. (FEC Mode allows you to group up to four ports from one FEC module to another FEC module in different Cisco switches.)

- ***Does Duralink64 Port Aggregation support Cisco's FEC?***

  Yes.

- ***Where can I learn more about Duralink64 Port Aggregation?***

  Go to the Adaptec Web site at: http://www.adaptec.com.

Duralink64 v5.*x* Windows NT – General Questions

- ***Which service pack has been tested with DuraLAN and Duralink Failover 4.0 drivers?***

  Windows NT Service Pack 3 (SP3). Microsoft generally recommends installing SP3 on all Windows NT systems. Before installing Duralink64 v5.*x* software, be sure to install SP3.

- ***Does Duralink64 v5.x support Novell's 32-bit client for Windows NT?***

  Yes. However, connecting clients to the NetWare Duralink64 server requires the NDIS driver. *Do not* use an ODI driver. See Chapter 6, *Installing Duralink64 Novell Client* on page 6-1 for details.

- ***How can I determine the status of a Failover group under Windows NT?***

  You can view the status of any Failover group using the status screen (Control Panel, Network Adapters, Status tab).

- ***Do the Duralink64 v5.x Failover drivers support AppleTalk under Windows NT?***

  No.

Duralink64 v5.x Windows 98 – General Questions

- ***How do I install Duralink64 v5.x software on my Windows 98 system?***

  Follow the standard Windows 98 Hardware Installation procedure using the Have CD option.

Duralink64 v5.*x* NetWare – General Questions

- ***I used Load Install to try to load my NIC and it's not working. What should I do?***

  For Standard, Failover, or Port Aggregation drivers, use configsf from the Duralink64 v5.*x* NetWare CD.

- ***What version of the service pack do I need for Duralink64 v5.x software?***

  Use SP6 and ODI 3.31 patches for NetWare 4.11 for all DuraLAN drivers. The DuraLAN drivers will not work unless you apply the patches to NetWare before installing the drivers.

- ***What should I do when upgrading from Duralink64 v5.x Standard drivers to Duralink64 v5.x Failover drivers?***

  Use setupsf to remove existing standalone drivers from the system. Use configsf from the Duralink64 v5.*x* NetWare CD to install the new failover drivers.

- ***It's not clear what should be done from the Failover Setup Menu. How do I configure the ports?***

  To install the Duralink64 v5.*x* Failover software on NetWare v4.2, v5.0, or v5.1, use configsf from the Duralink64 v5.*x* NetWare CD. At the Main Menu, select **Failover**, then, **Configure Ports**, **Set Failover Pairs**, **Configure Protocols**, **Install Software,** then **Save** and **Exit**. Make sure you follow this sequence and end with Save and Exit. The Save and Exit function modifies the autoexec.ncf file so that the Failover software is loaded each time you boot the server.

- ***How do I install Duralink64 v5.x Failover or Port Aggregation if I currently have the Duralink64 v5.x Standard drivers installed?***

  The setupsf file is used only when installing and uninstalling Duralink64 v5.*x* Failover or Port Aggregation software. The configsf file is also used after installation for changing the failover configuration.

- ***Does Duralink64 v5.x support Novell's 32-bit client for Windows 98, Windows 2000, or Windows NT?***

  Yes. However, connecting clients to the NetWare Duralink64 server requires the NDIS driver. *Do not* use an ODI driver. See the *User's Guide Windows 98*, *Windows 2000*, or *Windows NT Installation* sections for details.

C

Duralink64 SNMP Agents

Windows NT and NetWare SNMP agents are provided to support Failover and Port Aggregation capabilities. These agents handle standard port configurations, Failover pairs, and Port Aggregation. Use of the agents allow remote monitoring from any standard network management station with SNMP (version 1) support.

The following information is provided:

- **Information group**—containing card, port, and interface counts.
- **Interface statistics table**—listing characteristics and summary statistics for individual port interfaces, Failover groups, and multiple port load balancing groups.
- **Port statistics table**—listing all ports grouped by interface and providing characteristics and statistics for each individual port. Port 1 in any multiple group is always the port that is available to be bound to protocol stacks.
- **Card information table**—describing each Adaptec network card on the system.
- **Card port information table**—sorted by network card listing all ports and the interface to which they are assigned.
- **Trap definition**—for traps that are generated when the status of any port changes.

Monitoring the NICs by SNMP

The duralink.mib file must be compiled on the SNMP Management station to manage the NICs. This file is located on the Duralink64 for Windows CD in the snmpmibs directory.

SNMP Support

The message !SNMP service is not installed will appear during the installation and configuration of Windows NT if SNMP service is not installed. If SNMP functionality is not desired, ignore this message. If SNMP is desired, install SNMP Service using the Windows NT CD, then reinstall SP3.

The driver installation enables an SNMP agent to provide management information to the SNMP management station. The agent supports both the DuraLAN and older EMPCI NICs. However, if you install your EMPCI drivers after the DuraLAN installation, management information is restricted to the EMPCI configuration.

The .mib file used for your SNMP management console is located in the following directory: a:\snmpmibs\duralink.mib. After compiling this file on an SNMP management station, you will then receive traps or events relative to the DuraLAN network adapter.

Note: Duralink64 software does not support SNMP for Windows 2000 or UnixWare.

D

The Diagnostics Utility

Your Adaptec DuraLAN NIC is supplied with a DOS Diagnostics utility that is found on the LAN and Duralink64 Failover Drivers NetWare CD. Use the Diagnostics utility to check the functionality of your DuraLAN NICs.

Running the Diagnostics

From the Hard Disk Drive

To run the Diagnostics utility from your hard disk drive, follow these steps:

1 Make sure himem.sys and emm386.exe are currently in config.sys and that files=30 is present.

If they are not, add these lines to the top of the config.sys file:

```
device=c:\dos\himem.sys
device=c:\dos\emm386.exe /noems
files=30
```

Type the path to the DOS programs if it is not found in c:\dos.

2 Create a directory for the diagnostics on your hard disk drive.

3 Copy all files in this directory to the new diagnostics directory of the hard disk drive.

4 At the DOS prompt, type `go_diags`, and press **Enter**.

Note: The easiest way of testing a DuraLAN NIC is running the Selftest.

From the CD-ROM Drive

To prepare a DOS diagnostics boot disk, follow these steps:

1. Create a bootable DOS disk.
2. Copy the DOS files himem.sys and emm386.exe to the disk.
3. Copy all the files in this directory to the root directory of the DOS boot disk.
4. Start the system from the CD-ROM.
5. At the DOS prompt, type `go_diags`, and press **Enter**.

Note: The easiest way of testing a DuraLAN NIC is running the Selftest.

Diagnostic Tests

The following table lists the tests that can be run on the Adaptec DuraLAN Fast Ethernet NIC(s). The diagnostics commands are case sensitive and must be typed exactly as they appear in the table.

Command	Test
selftest	Verifies a variety of card functions. You should run this test first to isolate common errors.
port *X*	Specifies the port you want to test. If more than one DuraLAN NIC is installed, remove all cards, then test one card at a time.
display	Displays values of all chip registers.
loop	Performs multiple tests consecutively. At the last line before you run the tests, type end. For example: Loop>port 1 Loop>selftest Loop>port 2 Loop>selftest Loop>end
EEPROM	Tests contents of serial EEPROM and displays it on screen.
exit	Exits the Diagnostics utility.

Command	Test
hbi_slave	Tests slave accesses, checks serial EEPROM, and checks register accesses to the chip.
hbi_dma	Checks DMA transfers to and from the board.
mac	Tests registers and various functions of Ethernet controller.
address_filter	Tests Ethernet packet filtering capabilities.
internal_10_mac	Tests internal loop-back at 10 Megabits/sec within the chip.
internal_100_mac	Test internal loop-back at 100 Megabits/sec within the chip.
internal_10_phy	Tests loop-back from the physical device at 10 Megabits/sec.
internal_100_phy	Tests loop-back from the physical device at 100 Megabits/sec.
external_10	This test requires a loop-back cable. It tests the loop-back from the cable at 10 Megabits/sec.
external_100	This test requires a loop-back cable. It tests the loop-back from the cable at 100 Megabits/sec.
autonegotiate <speed> (speed is one of five options)	Tests the speed the card negotiates. This test has five options: 0 – Tests for full autonegotiation (highest speed) 10 – Forces test at 10 Megabits/sec half duplex 20 – Forces test at 10 Megabits/sec full duplex 100 – Forces test at 100 Megabits/sec half duplex 200 – Forces test at 100 Megabits/sec full duplex **Note:** Requires a hub, switch, or loop-back cable. Also, autonegotiate defaults to 10 MB if the cable is not connected.
checksum	Tests the abilitiy to calculate TCP/IP checksum.
statistics	Verifies statistics gathering features of the chip.

Command	Test
echoer #/sender # (where # is the number of packets to send)	This test requires two computers on a private network: one as the sender, and the other as the echoer. This test is useful for testing the network and verifying that data is being passed between the echoer and the sender. Enter the echoer command first, then enter the sender command in the sender system. *(This command sequence is critical.)* The two commands work in tandem. The echoer system displays the number of packets received, then exits. The sender system displays a summary of packets transmitted and received, corrupted packets, number of collisions, and lost packets.
pause	Tests the flow controller features of the chip.
mem (default)	Slave access set to Memory Mode.
io	Slave access set to I/O Mode.
timer	Tests the interrupt delay time feature of the Ethernet controller.
power-management	Tests the power-down features of the Ethernet controller.
mod (mac offset data)	Allows the modification of the Ethernet controller registers.
help or ?	Displays all diagnostics commands.

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